HELSINKI SCHOOL OF ECONOMICS (HSE)
Department of Accounting and Finance

# THE PRICING OF CONVERTIBLE DEBT OFFERINGS IN WESTERN EUROPE 1998 - 2001



Finance
Master´s thesis
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Fall 2002

Approved by the Council of the Department 3 / 12 2002 and awarded the grade excellent 80 points

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| Title<br>The Pricing of Convertible Debt Offerings in Western Europe 1998 - 2001 | | |
| Subject<br>Finance | | |
| Level<br>Master's thesis | Month and year<br>December 2002 | Number of pages<br>71 |


Abstract

## The objective of the study

The objective of this study was to analyze the pricing of Western European convertible debt offerings. Specific objectives were:

- to find out whether convertible debt offerings in Western Europe are, on average, underpriced and
- to find factors influencing the pricing behavior of these offerings.

## Sources of information and data

The main sources of information were various finance journals examining the pricing of IPOs, equity offerings, straight debt offerings and convertible debt offerings. In particular, the study of the pricing of convertible debt offerings in the US market in 1988 – 1992 conducted by Kang and Lee (1996) was the main source of information for this thesis. The data was collected from two sources: basic information about convertible debt offerings in Europe was obtained from the SDC Platinum database from the time period of October 1998 to September 2001. More detailed data related to the offerings and the underlying stocks and the issuing companies was collected from Bloomberg Professional™ service. The sample data consists of 105 Western European convertible bond offerings.

## The method of research

The convertible debt offerings were examined with methods equivalent to Kang and Lee's (1996) study. Initial raw returns of the offerings were calculated as the return from buying at the offer price and selling at the closing market price on the first day of public trading. Especially market adjusted initial returns were examined, which are defined as the initial raw return minus the corresponding UBS Warburg European Convertible Index return. The correlations of these initial excess returns with different variables related to the issue characteristics and especially to different risk factors were then studied.

## The findings

A significant mean initial excess return of 1.43% with 64.8% of the returns positive was found in the sample data of 105 European convertible debt offerings. This result was found to be invariant to bond ratings, coupon rate, maturity, equity beta and probability of conversion. However, issue size divided by issuing firm size, standard deviation of stock returns, market sentiment and underwriter reputation were found to have some explanatory power on the initial pricing of the offerings. Unlike equity IPOs, new issues of European convertible debt neither underperform nor outperform the market for at least in the first year after the offer.



Key words
Convertible debt offerings, underpricing, asymmetric information

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## 1 Introduction

The underpricing of initial public offerings (IPOs) of common stock is a well-known and widely studied phenomenon. The research on IPO underpricing dates back to the 1970's with the first researchers to report systematic IPO underpricing being Stoll and Curley (1970), Reilly (1973) and Ibbotson (1975). One of the most recent and also extensive papers on this subject is the Ritter and Welch (2002) study, which reports an average first-day return of 18.8% for a sample of 6,249 IPOs in the United States market from 1980 to 2001. Ljungqvist (1997) studied 189 IPOs in the German market from 1970 to 1993 and the result was an average underpricing of 9.2%. In addition, Ritter and Welch (2002), who thoroughly reviewed the existing IPO literature, claim that they know of no exceptions to the rule that the IPOs of operating companies are underpriced, on average, in all countries.

Such a large anomaly related with initial public offerings has inspired the creation of numerous theoretical explanations for the large initial returns received by investors of new common stock. For the most part, these explanations focus on why underwriters might choose to (deliberately) underprice IPOs. The alternative reasons for underpricing include: "the winner's curse" (Rock 1986), costly information acquisition (Benveniste and Spindt 1989), cascades (Welch 1991), information asymmetries between issuers and their investment bankers (Baron and Holmström 1980; Baron 1982), avoidance of legal liability (Tinic 1988; Keloharju 1993), signaling (Allen and Faulhaber 1989; Welch 1989), regulatory constraints, wealth redistribution and market incompleteness (Mauer and Senbet 1992).

The pricing of straight bond and seasoned equity issues has also been studied. Loderer et al. (1991) examined 1,600 seasoned US equity offerings in 1980 – 1984 and reported a significant and slightly positive first day excess return of 0.35%. The underpricing literature related with straight debt offerings include the Wasserfallen and Wydler (1988) study, which examined 328 issues of new straight bonds issued by Swiss debtors during the years 1980 – 1982. A slight underpricing result, which was roughly equal to the difference in transactions costs between the markets for new and seasoned bonds, was revealed. In addition, Datta et al. (1997) examined 50 straight bond IPOs from 1976 to 1992 and found that IPOs of speculative grade debt are underpriced, while those rated investment grade are overpriced.

Although there is substantial empirical evidence on new issue price performance of various types of corporate securities, similar evidence on convertible bonds is almost absent in the literature. Kang and Lee (1996) state that their paper is the first empirical evidence on the pricing of convertible debt offerings. They collected a sample of 91 convertible debt offerings that were listed on either the New York Exchange Bonds or the American Exchange Bonds in the period 1988 – 1992. The study shows a significant mean initial excess return of 1.11%, which is invariant to zero/nonzero coupons, maturity, issue size and bond ratings. Kang and Lee (1996) do find, however, that various types of risk inherent in the convertible issues partly explain the cross-sectional variation in the initial excess returns. They interpret these results as consistent with the differential information model (Barry and Brown 1985).

Studies concerning the pricing of security issues are widely conducted in the US market and more seldom in the European markets. The results from North American studies are also not always applicable to Europe and specifically the convertible security markets of the US and Europe have different characteristics relating to issuers and the investor base according to Wright (2000). In addition, the pricing of convertible debt offerings in Europe is totally unexamined. This study aims to fill that gap.

Loughran and Ritter (2002) argue that underpricing in security offerings is equivalent to issuers leaving money on the table, defined as the number of securities sold times the difference between the first-day closing market price and the offer price (or the initial raw return times the size of the issue). They find that the average IPO leaves $9.1 million on the table, which is approximately twice as much as the fees paid to investment bankers and represents a substantial indirect cost to the issuing firm. In a convertible debt setting it is also interesting to view the underpricing as an indirect cost of issuing convertible debt.

This thesis has two objectives:

- to find out whether convertible debt offerings in Western Europe are, on average, underpriced and
- to find factors influencing the pricing behavior of these offerings.

By examining the pricing of convertible debt offerings I shed light on how the initial returns of convertible debt offerings relate with returns observed for other security classes. A comparison between the initial convertible debt returns in the European and North American

markets is also conducted. The reason for choosing Western European offerings instead of only Finnish issues is simply because of the small size and amount of convertible debt offerings in Finland. The results of this thesis are, however, interesting also from the Finnish point of view, because offerings in Europe give a reference point for the characteristics and price setting of a Finnish issue (Kallio 2002).

There are no specific theories for the underpricing of convertible debt offerings, but the dualistic nature of convertible bonds enables the testing of underpricing theories created for both equity and straight debt offerings. The contribution of this thesis is in the testing of already existing hypotheses and theories of underpricing, most of which stem from the IPO literature, with European data.

This thesis is organized as follows. The next section gives a brief overview of convertible bonds (CBs), their basic characteristics and valuation. In addition, the European convertible bond market is described. Section 3 examines previous research related to the pricing of security offerings and Section 4 summarizes the hypotheses used in this study. Section 5 describes the sample collection procedures and Section 6 explains the initial return measures and gives a brief overview of the statistical methods used. Section 7 presents the results of the empirical study and Section 8 summarizes the thesis and presents conclusions.

## 2 Background information on convertible bonds

Connolly (1998, 1) describes convertible bonds as financing vehicles that are part bond and part equity. This duality makes CBs interesting to a variety of investors. Some investors are more interested in the bond part and some only in the equity part, but most get involved because the instruments can be bond one day and equity in the other. Many CBs are complicated by the presence of call and put provisions and some are also affected by the levels of foreign exchange rates. Before going into details of convertible bonds I shall first discuss the individual components of convertible debt, bonds and equity.

### *2.1 Bonds*

Bonds are issued by governments, local authorities and corporations and are generally purchased by investors, fund managers and speculators. Essentially, bonds are loans from one party to another. Governments and corporations issue bonds usually to finance large projects such as the building of a new dam or the acquisition of another company. The issuance or

flotation of a bond represents the generation of a contract between the bond issuer and the bondholder. The issuer agrees to pay a fixed amount of money (the redemption proceeds or redemption price) at the end of a given time period. In addition, most bonds also pay a fixed coupon. Coupons are usually paid annually or semi-annually and are announced as a percentage of the redemption price. (Connolly 1998, 1 - 2)

When someone buys a bond at issue he is essentially lending some entity a lump sum of money today in return for the promise of a stream of future payments and a final lump sum. As the bond is sold and bought over time, the parties exchange lumps sums of cash and forward the promised future payments to someone else. Eventually the maturity date arrives and the final coupon and the final redemption price will be paid to the last person holding the bond. After the maturity date the bond no longer exists. So when buying a bond you know for sure the cash flows that the bond will generate. This is the reason why bonds are classified as low- or no-risk investments; in theory anyway. (Connolly 1998, 2)

Unfortunately some issuers default and this is where the problems arise in trying to price some bonds and why it is meaningless to classify all bonds as risk free. Most government-backed and blue-chip corporations' issues never fail, but some corporations do get into trouble and either default on a coupon or even the redemption proceeds. To quantify the risk related with defaulting there exist a number of corporations that do nothing else but rate corporate bonds. Corporations that are considered to have a very low risk of default are rated AAA. The 9-step rating scale goes all the way down to C (Brealey and Myers 2000, 691). Bonds rated between BBB and AAA are called investment grade bonds and bonds with a rating of BB and lower are called junk bonds. The ratings also change from time to time. This change happens usually because of some event that affects the future likelihood of default. If the worst-case scenario happens and the company goes into liquidation, the bondholders usually stand in line of any other creditor. (Connolly 1998, 2)

### *2.2 Equity*

Owning equity is the same as having a stake in the company's fortunes. If the company does well, the share price will increase and vice versa. Unlike a corporate bond a share represents a sort of ownership. Owning a share in a company that has one million shares outstanding means that you own one millionth of all the company's assets. Corporations usually pay dividends to shareholders but not necessarily. Some corporations pay small or no dividends,

preferring to plough back profits into growing the business. An excellent case of this is the success of Microsoft Corporation – a company that pays no dividends at all. (Connolly 1998, 2 - 3)

For obvious reasons, holding shares is considered to be more risky than holding bonds and this has been empirically shown to be the case historically. Equity holders expect and in the long run usually achieve higher returns for taking higher risk. In the event of bankruptcy, the equity holders are usually the last ones for any of the remaining assets. (Connolly 1998, 3)

### *2.3 Convertible bonds*

Convertible bonds are interesting in that when they are issued no one really knows what sort of instrument they will end up with – shares or bonds? Neither the issuing corporation nor the individual buying has any idea of what will happen. What eventually happens depends on numerous factors. If the quoted share price rises significantly, the CBs can all be converted (once and for all) into shares. In the case that the share price remains the same or falls the CBs could eventually be redeemed just like a regular straight bond. It is this feature that makes these investment vehicles so unusual and seemingly difficult to price. The uncertainty of what is going to happen to the instruments in the future has a huge impact on today's price behavior. The key feature of a CB that makes it a hybrid security consisting of equity and debt components is that the individual holding the instrument has an option; he can turn it into equity at any time or let it run to expiry and take a cash lump, just like a bond. The decision is the investor's. (Connolly 1998, 3)

Philips (1997, 1) defines convertible securities as follows: "A convertible security is a bond or preferred stock issued by a company which gives the right but not the obligation to convert into another security, most commonly the company's underlying shares". The amount of stock obtained in exchange for one convertible bond is indicated by the exchange ratio (conversion ratio), which may be a function of time. Convertible bonds are also usually callable, which means that the issuer has the right to buy back the bonds. The call price gives the price at which the bond can be bought back. This is also often a function of time. Once the bonds have been called the holder has the right to convert them into shares. The call feature is, therefore, usually a way to force the bonds to be converted earlier than the holder would otherwise choose. (Hull 2000, 646)

### *2.3.1 Exchangeable bonds*

An exchangeable bond can have any of the characteristics of convertible bonds discussed above, but an exchangeable bond entitles its holder to convert into shares of *another* company. For example, if a large corporation owns EUR 100 million of shares in another company (domestic or international) and it wishes to sell these for strategic reasons, it may do so by issuing an exchangeable bond with its own associated credit rating. Assuming that the bonds convert into the issued shares no dilution will occur. Therefore, issuing exchangeable bonds may be a particularly useful way for companies to divest interests in other companies. For example Italian and Malaysian governments have used this method when selling state interests in companies. (Philips 1997)

### *2.3.2 Valuing a convertible bond*

Convertible bonds have many different characteristics that affect the value but Figure 1 presents a simple framework for the valuation of a plain-vanilla convertible bond. The floor price of a convertible bond is always the straight debt value (debt component), i.e. the value of the bond would it not be convertible into common stock (Figure 1A). The straight bond value is almost independent of the value of the stock for healthy firms. However, if the stock price falls and the firm is close to bankruptcy, default risk increases and the value of the bond falls. The conversion value of the convertible bond (equity component) equals the value it would have if you converted it into stock immediately (Figure 1B). This value is another lower bound for the market value of the convertible bond. Figure 1C presents the value of the convertible bond.

Since convertible bondholders do not have to make a decision to convert until maturity, the value of the convertible bond is worth more than either the straight bond value or conversion value. The difference between the convertible bond value and the lower bound determined by the conversion value and the straight debt value is the value of the option that the convertible bondholder has. In practice, though, the valuation of convertible bonds isn't that straightforward. First, the conversion price is often a function of time, which means that the exercise price of the option changes over time. Second, the option valuation is complicated also because the stock may pay several dividends over the life of the bond. Third, most convertibles are callable by the issuer so both the investor and the issuer hold options on each other. (Bodie et al. 1999)

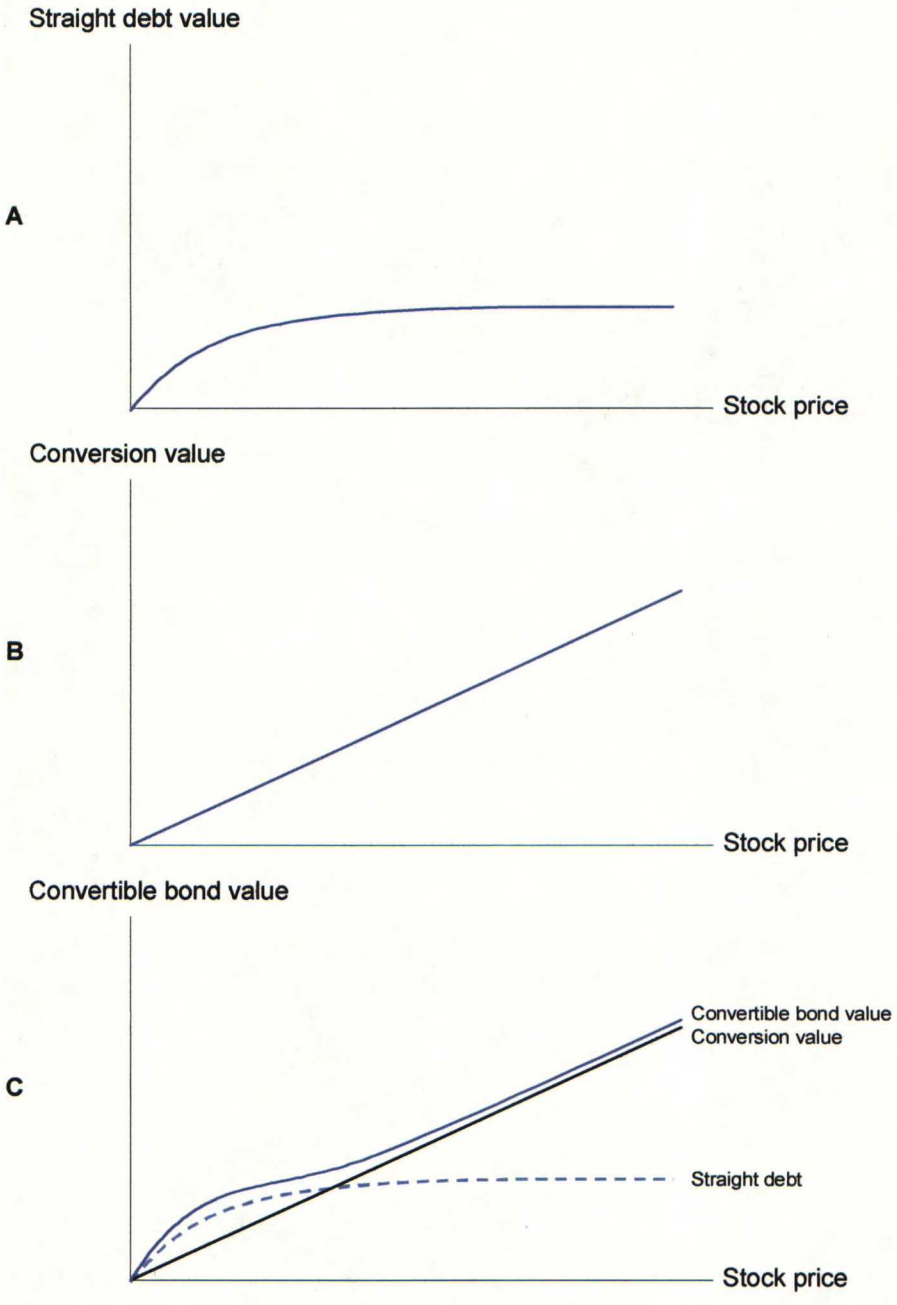


**Figure 1. Value of a convertible bond as a function of stock price.** A, straight debt value or bond floor. B, Conversion value of the bond. C, Total value of convertible bond.
Source: Bodie et al. (1999)

### *2.3.3 Debt and equity components of a convertible bond*

Measuring the debt and equity components of convertible bonds is subject to both complexity and subjectivity. Theoretically, only non-callable discount CBs, with no dividend payments to the common stock, can be separated into an ordinary discount bond (the debt component) plus a warrant (the equity component) entitling the owner to purchase common stock upon an exercise payment equal to the principal of the bond. Usually, though, convertible bonds are

more complex with embedded puts and calls and cannot be to the fullest extent unbundled in a set of standard instruments. The major problem here is that the different components generally interact (Ingersoll 1977). Brennan and Schwartz (1977) and Connolly (1998) use a numerical method for determining the value of complex CBs, and this is often used for calculating the value of their standard components. Table I summarizes results obtained by several researchers in separating CB components. (Burlacu 2000)

**Table I**
**Equity components for convertible bond issues as calculated in some empirical studies**

| Authors | Period | Number of observations | Equity component (%) | Method |
|---|---|---|---|---|
| King (1984) | - | 103 | 18 | Numerical method |
| Brennan and Her (1993) | 1976 – 1985 | 155 | 28 | Discounting model |
| Billingsley et al. (1986) | 1977 – 1983 | 95 | 39 | Two-equation model |
| Janjigian (1987) | 1968 – 1983 | 357 | 60 | Regression model |

Source: Burlacu (2000)

Even though all the studies in Table I concern CBs in the same market (US) and for similar periods, these results are contrasting, thus revealing the difficulty of separating the CBs equity and debt portions. The numerical method of Brennan and Schwartz (1977) relies on the restrictive hypothesis that the managers' call strategies are always optimal and therefore underestimates the equity component. In empirical studies convertible bonds are often classified by their *probability of conversion*. This is the probability that the CB will be converted into equity before or at maturity. The various proxies used for the equity component in the empirical literature are presented in Table II. (Burlacu 2000)

The *time to conversion* used by Davidson et al. (1995) represents the ratio between the firm's signaled growth rate and the market a priori expected growth rate. A low *time to conversion* indicates a high equity component because the CB may be rapidly be at-the-money and, consequently, be converted into equity. Kuhlman and Radcliffe's (1992) proxy also quantifies the ability of management to force the conversion of the CBs. The proxy used by Janjigian (1987) for the debt component takes into account the volatility of the underlying stock and the maturity of the CB. (Burlacu 2000)

**Table II**
**Proxies used in the literature for approaching the equity component of convertible bonds**

| Authors | Proxy for the probability of conversion | Remarks |
|---|---|---|
| Beatty and Johnson (1985) | Call price/conversion value | Measures the potential to force conversion for callable CBs |
| Kuhlman and Radcliffe (1992) | Conversion price/stock price | Measures the potential of managers to motivate bondholders to convert soon after the issue |
| Davidson et al. (1995) | Time to conversion $T = [\ln(CP) - \ln(P)]/\mu$ | It is the expected time the CB will be *at the money*. CP, conversion price; P, current price of common stock; $\mu$, rate of stock price appreciation |
| Janjigian (1987) | $N\{[\ln(CP) - \ln(P)]/\sigma T\}$ | CP, conversion price; P, current price of common stock; $\sigma$, volatility of the underlying stock; T, time to maturity; N, cumulative probability under a standard normal distribution |

Source: Burlacu (2000)

### *2.3.4 Why firms issue convertible debt?*

Two popular motives that financial executives give for issuing convertible debt are the lower interest rates relative to those on straight debt and the opportunity to issue equity at a premium to the current share price. However, financial economists have pointed out that this argument is flawed. It compares convertibles to straight debt in a situation, where the firm does poorly and straight debt would have been more burdensome. In addition, it compares convertibles to equity in a situation, where the firm does well and equity proves more dilutive. What this argument fails to mention is that the firm would have been better off issuing straight debt if it does well (for then there is no dilution for equity) or common equity if it does poorly (when the burden of servicing straight debt would turn out to be greatest). (Lewis et al. 1998)

Academics have offered a number of rationales that avoid the above mentioned fallacy. The first theoretical justification for convertibles consistent with the modern finance theory was provided by Jensen and Meckling (1976) in their much-cited paper on agency costs. They argue that convertibles help to control shareholder-bondholder conflicts in two ways: First, by providing bondholders with the right to convert their claims into equity, management gives bondholders the assurance that they will participate in any increase in shareholder value that

results from increasing the risk of the company's activities. Second, by reducing current interest rates and so reducing the likelihood of financial trouble, convertibles also reduce the probability that financially strapped companies will be forced to forgo valuable investment opportunities.

Brennan and Schwartz (1988) argue that convertibles are also potentially useful in resolving disagreements between managers and bondholders about just how risky the firm's activities are. As suggested above, the value of convertibles is relatively insensitive to changes in company risk for the following reason: Although unexpected increases in company risk reduce the value of the debt component of a convertible, they also increase the value of the embedded option on the company's stock by increasing volatility.

Stein (1992) gave the Brennan-Schwartz argument a somewhat new twist. Building on the insight that many convertible bond issuers build equity through forced conversion of convertibles, Stein developed a model that uses information asymmetry between managers and investors and the resulting information costs to explain why especially growth firms find it attractive to issue convertibles to build equity. In circumstances, where both straight debt and equity appear to have significant costs, managers with a great deal of confidence in their firm's growth prospects may conserve significant value by issuing convertibles and planning to use the call provision to force conversion when the share price rises in the future. Moreover, to the extent that the market is persuaded that convertible issuers have solid growth prospects but no other economic financing options (i.e., there is little additional debt capacity and a straight equity issue is ruled out by the management as too dilutive), it is likely that the stock market will respond less negatively (or even positively) to the announcement of a new convertible issue.

It seems that the practitioners' motives for using convertibles are miles apart from the academics' explanations. The finance literature admits that the fundamental reasons for firms using convertibles remains an unresolved question (Mayers 1998).

### *2.4 The European convertible bond market*

The use of convertible debt as a financing vehicle in Europe has grown substantially in the past few years. In 2001 new issues of convertible bonds in the European market amounted up to €50.8 billion as shown in Figure 2. This means a rise of 85% from the year 2000 and a five-

fold increase from €10 billion in 1996. Exchangeables represented 65% of the total amount raised in 2001 compared with 50% in 2000. Rubery (2002) gives a practitioner's view and explains that the popularity of convertible securities in 2001 was due to a combination of low interest rates, record-high volatility, low share prices and an increase in the number of potential investors. Roemer (2001) also argues that the introduction of the euro in January 1999 created a much larger and more liquid pool of convertibles in Europe. (Rubery 2002)

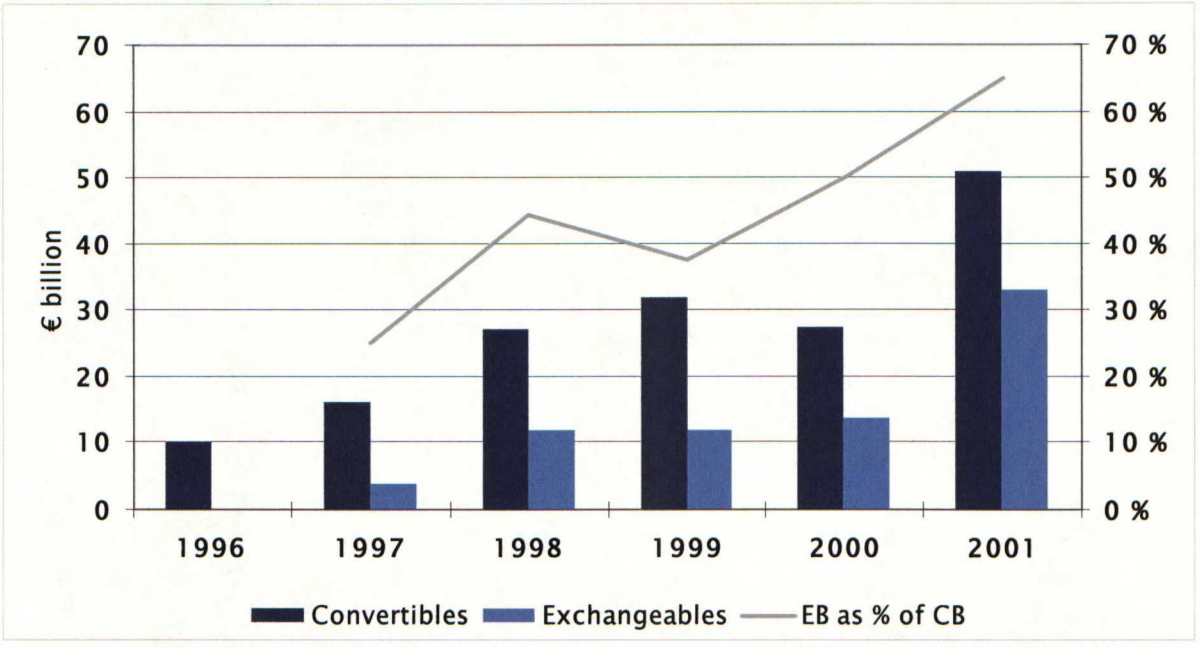


**Figure 2. Convertible debt issuance in Europe.** Figure shows the annual issuance of European convertible bonds in billions of euros in the period 1996 – 2001. The total issuance of exchangeable convertible bonds is also presented. In addition, the line depicts the portion of exchangeables from the total amount of convertible bonds.
Source: Rubery 2002 and WestLB Panmure 2002

The European convertible debt market consists mainly of 8 countries: UK, Germany, France, Netherlands, Italy, Switzerland, Belgium and Greece. Figure 3 shows that the main three markets are UK, Germany and France, where the issued convertible bonds amounted up to 62% of the total European issuance in 2000. (Baccardax 2001)

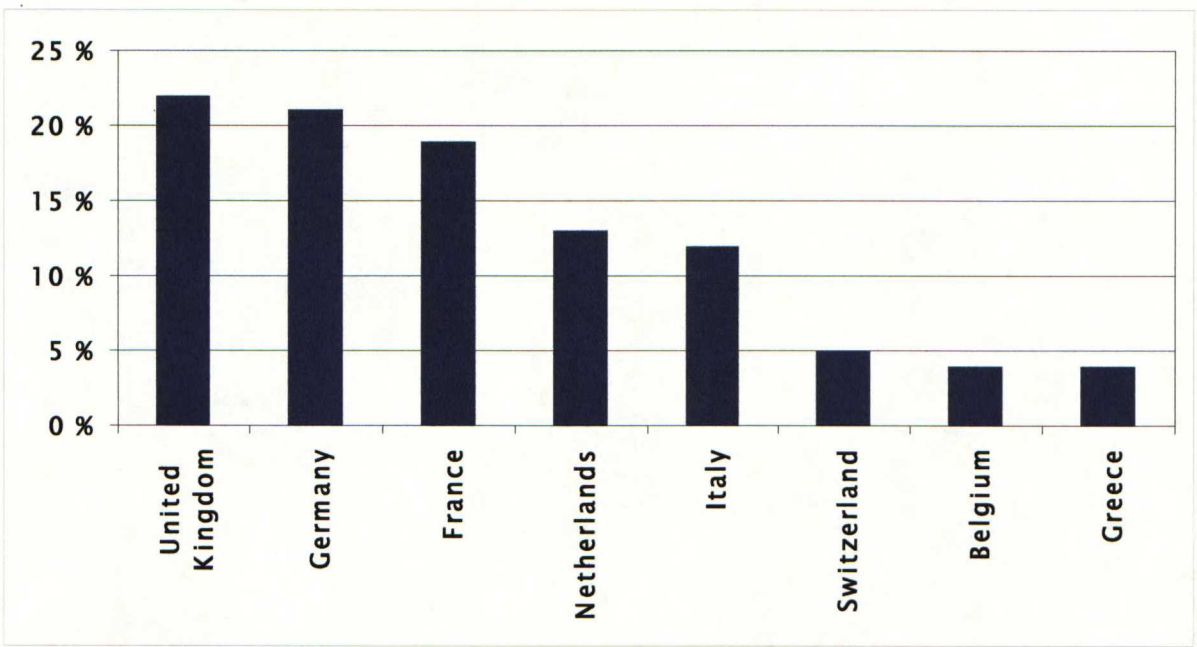


**Figure 3. Convertible debt issuance by country in 2000.** Figure shows the percentage of the total European convertible debt issuance in 2000 issued in each country.
Source: Baccardax 2001

## 3 Previous literature on the pricing of security offerings

To the best of my knowledge, there is only one study available on the pricing of convertible debt offerings, so I shall first present research from equity offerings and then from straight debt offerings. This is also justified from the point of view that convertible debt is a hybrid security with both debt and equity like characteristics and the pricing of convertible debt offerings is also assumed to have both debt and equity characteristics.[1] In the end of this section I shall summarize the study of convertible debt offering pricing done by Kang and Lee (1996).

### *3.1 Pricing of initial public offerings*

The first researchers to document a systematic increase from the offer price to the first day closing price were Stoll and Curley (1970), Reilly (1973) and Ibbotson (1975). Since then the phenomenon of IPO underpricing has been subject to extensive research in the finance literature. In a sample of 6,249 IPOs from 1980 to 2001 Ritter and Welch (2002) found an average first-day return of 18.8 percent. They also know of no exceptions to the rule that the IPOs of operating companies are, on average, underpriced in all countries. Generally the

[1] This is also the approach used by Kang and Lee (1996) to the pricing of convertible debt offerings.

offerings of non-operating companies, such as closed-end funds, are not underpriced. IPO underpricing seems also to have increased over time. Loughran and Ritter (2001) studied 6,169 IPOs in 1980-2000 and reported a 7.4% average first-day return in the 1980's, a 14.8% return in 1990-1998 hiking up to 65.0% during the internet bubble years of 1999-2000.

These findings have inspired several academics to create theoretical models designed to explain the phenomenon of systematic underpricing. Datta et al. (1997) and Loderer et al. (1991) summarize from previous studies that these models are based on information asymmetry between market participants, the risk of litigation due to legal liability, monopsony power of investment banks and incomplete markets. Ritter and Welch (2002) classify theories of underpricing on the basis of whether asymmetric information or symmetric information is used. Asymmetric information can in turn be divided into theories in which IPO issuers are more informed than the investors (about internal projects, for example) and into theories in which investors are more informed than the issuer (about demand, for example). In the next sections I shall present some of the most prominent theories of IPO underpricing.

### *3.1.1 The issuer is more informed than investors*

Assuming that the issuer is more informed than investors, rational investors fear a lemons problem: only worse-than-average quality issuers are willing to sell their shares at the average price. To distinguish themselves from low-quality issuers, high-quality issuers may attempt to signal their quality. In these models, better quality issuers deliberately sell their shares at a discount to what the market believes they are worth, which deters lower quality issuers from imitating. In the long run, these issuers can recoup their upfront sacrifice after the IPO, either in future issuing activity (Welch 1989), favorable market responses to future dividend announcements (Allen and Faulhaber 1989) or analyst coverage (Chemmanur 1993). Theoretically, however, it is unclear why underpricing is a more efficient signal than, for example, committing to spend money on charitable donations or advertising. (Ritter and Welch 2002)

### *3.1.2 The underwriter is more informed than the issuer*

Baron (1982) offers an agency-based explanation for underpricing. His model of asymmetric-information assumes that the investment bankers have more information about investors' demand for the securities than the issuers possess. Therefore, the issuer may delegate the

pricing decision to the underwriter, who demands a compensation for the use of his superior information. This compensation may be in the form of letting the underwriter offer the security at a discount from the price expected in the aftermarket. Baron finds that the discount is an increasing function of the issuer's uncertainty about the market demand for its securities. Therefore, IPOs that are subject to greater uncertainty about the market clearing prices are predicted to be more underpriced on average.

Muscarella and Vetsuypens (1989) study underwriters that go public and find that their shares are just as underpriced even though the above described monitoring problem does not exist. This evidence, therefore, does not support the Baron hypothesis but it does not refute it either. Ritter and Welch (2002) suggest that underwriters may want to underprice their own offerings in order to make the case that underpricing is a necessary cost of going public.

### *3.1.3 The winner's curse*

Rock's (1986) model is perhaps the most influential among many explanations of the IPO underpricing puzzle. This model is also based on information asymmetry but Rock distinguishes two groups of potential investors: the so-called *informed* investors and *uninformed* investors. The informed investors are large institutions, which are assumed to have better information about the quality of new issues than small uninformed investors. Consequently, informed investors will attempt to purchase shares only when an issue is underpriced, but the amount they can buy is rationed. Uninformed small investors, on the other hand, do not know which offerings will be underpriced, so they will be allocated only a fraction of the most desirable new issues, while receiving all of the least desirable new issues. Uninformed investors thus face a winner's curse: if they are allocated all the shares they demand, it is because the informed investors do not want these shares. Faced with this adverse selection problem, uninformed investors will take part in IPOs only if they are underpriced sufficiently, on average, to compensate the uninformed investors for the bias in the allocation of new issues. Taking the average underpricing and the restricted allocations into account, Rock's model also predicts that the difference between subscription price and first-day listing price should yield uninformed investors the risk-free rate of return.

Empirical tests of the Rock's model are impossible to conduct in the United States and most parts of the world because information on the rationing process adopted by underwriters and issuers is not observable. Koh and Walter (1989), though, test the Rock's model in Singapore, where the unique institutional arrangements governing the new issues market make evidence

on rationing publicly available. Koh and Walter find strong empirical support for the Rock's major implications. Uninformed investors investor's returns do not statistically differ from the risk-free rate of return. In addition, the authors show that rationing is applied far more stringently in underpriced than in overpriced initial public offerings.

### *3.1.4 Underwriter reputation*

Using Rock's (1986) framework, Carter and Manaster (1990) model the role of the investment banker's reputation. They show that more prestigious investment bankers are associated with less risky IPOs. To preserve its reputation, the prestigious underwriter screens the companies going public and selects the less risky ones, using information unavailable to the general public. This, in turn, reduces the uncertainty and information asymmetry between informed and uninformed investors. Investors know that by subscribing to issues of reputable investment banks they face less risk and, consequently, the first day return is lower for these offerings. Using a sample of 501 equity IPOs in the United States between 1979 and 1983 Carter and Manaster (1990) find a significant, negative relation between the underwriter reputation and initial return. Datta et al. (1997) study 50 US straight debt IPOs in 1976 – 1992 and they also find that investment banker quality is a significant determinant of bond IPO returns.

## *3.2 Pricing of seasoned equity offerings*

Loderer et al. (1991) argue that most theories considering the underpricing of IPOs due to information asymmetry should apply to seasoned equity offerings as well. The amount of underpricing should, though, be modest compared to IPOs because the amount of information asymmetry for seasoned equity offerings is much lower than for IPOs. In addition, there exist a few theories specifically created to explain the underpricing phenomenon in issues of seasoned equity, one of which is the Parsons and Raviv (1985) study.

Parsons and Raviv (1985) assume the existence of two classes of investors with different reservation prices. The firm cannot identify the high-value investors to whom it wishes to sell resulting in a demand curve for the stock with finite price elasticity. Consequently, investors with high reservation prices, concerned about the probability of oversubscription, drive the pre-issue and, as a result, the post-issue price above the offer price. Loderer et al. (1991), however, examined 1,600 US seasoned equity offerings and found only a significant 0.35%

first day mean excess return. In addition, the median was zero and only 30% of the returns were positive.

### *3.3 Pricing of straight debt offerings*

Datta et al. (1997) argue that information asymmetry between managers and capital markets is not eliminated subsequent to the equity IPO. Therefore, IPO models predicting increased underpricing with information asymmetry also partly apply to the pricing of corporate straight debt offerings.

Datta et al. (1997) view straight debt of being made up of risk-free debt and equity. Thus, the riskier the debt offer, the larger the equity component is in the security. Datta et al. (1997) also summarize a number of empirical studies that indicate that junk bonds have more systematic risk and behave more like equity than investment grade bonds. Therefore, the IPO returns of low-grade debt should behave more like equity IPO returns compared to the returns of investment grade debt offerings. Datta et al. (1997) also find in their empirical study that junk bond issues are underpriced and investment grade bond issues are overpriced.

Scholes (1972) presents the price pressure hypothesis in a stock market setting. He argues that when the size of a trade of shares is large relative to other small trades, which can easily be conducted at the prevailing market price, the price of the stock must fall to induce investors to purchase these additional shares. Wasserfallen and Wydler (1988, 1187) adjust the price pressure hypothesis in the context of debt offerings and state that "investors are only willing to absorb a large volume of new bonds if a price discount is offered because the necessary portfolio reallocations involve transactions costs". In other words, the larger the issue, the larger the expected underpricing is. The empirical study conducted in the Swiss capital market did not support this hypothesis, though. In addition, Wasserfallen and Wydler (1988) found a slight underpricing of newly issued bonds, which was roughly equal to the difference in transactions costs between the markets for new and seasoned bonds.

### *3.4 Pricing of convertible debt offerings*

Kang and Lee (1996) divide convertible bonds into three categories: conventional convertibles, put convertibles and zero-coupon convertibles. A conventional convertible usually has a conversion premium of 15% to 25% and has a high probability of conversion into equity. Therefore such convertibles are widely used as an alternative to an equity issue.

With a put convertible the investor has the right to redeem the bonds early, at a premium to par. Put convertibles have much lower probability of conversion and, therefore, have more debt-like characteristics than conventional convertibles. A zero-coupon convertible has typically the highest conversion price and is the most debt-like of all convertibles.

The empirical results in Kang and Lee's (1996) study, using a sample of 91 convertible debt offerings over the 1988 – 1992 period, indicated a mean initial excess return of 1.11% with nearly 70% of excess returns positive. The initial excess returns were also reported for various subsamples: zero/nonzero coupons, different maturities, different issue sizes and different bond ratings. As the significant initial underpricing result did not change for the various subsamples Kang and Lee (1996) argue that the underpricing is invariant to the offering characteristics of the convertible debt issues.

Kang and Lee (1996) classify the possible explanatory variables that may be related to the initial underpricing into three groups: ex ante uncertainty variables, straight-debt-component risk variables and equity-component risk variables. Each group will be examined in turn.

### *3.4.1 Ex ante uncertainty variables*

Kang and Lee (1996, 238) refer to the differential information model by Barry and Brown (1985), which states that "when the market clearing price of a new issue is uncertain, the aftermarket price is subject to extra risk until investors collect and process enough relevant information to price the new issue". In addition, an extension of the winner's curse model states that the winner's curse problem is exacerbated as ex ante uncertainty regarding the market-clearing price of a new issue increases (Rock 1986).

Ritter (1991) argues that risky IPOs require higher average initial returns and that the age of the issuing firm is a proxy for that risk. Ritter also finds a strong monotonic relation between the age of the issuer and the initial return of IPOs. Following Ritter (1991), Kang and Lee (1996) take the age of the issuing firm as a proxy for ex ante uncertainty. As a second proxy they use the standard deviation of daily raw returns of the issuing firm's common stock for the period from 220 to 20 trading days before the offer date. The empirical results indicate that convertible debt offerings made by less mature firms are more underpriced than those made by mature firms. The premarket standard deviation of stock returns did not have any reliable relation to the initial excess return.

### *3.4.2 Straight-debt-component risk variables*

Kang and Lee (1996) divide the straight-debt-component risk into interest rate risk and default risk. They examine the relation of the initial underpricing of new convertible issues and the interest rate risk with Macaulay's duration measure and the relation of the default risk with the issue's rating. However, the empirical results showed no sign of relation between the straight-debt-component risk variables and the initial excess return.

### *3.4.3 Equity-component risk variables*

As mentioned earlier, convertible bond is a hybrid security with debt and equity like characteristics. The value of a convertible bond is a combination of its straight bond value and its conversion value. As the conversion value depends on the issuing firm's equity value the systematic risk of the issuer's equity is part of the risk included in the new convertible issue. Kang and Lee (1996) use equity beta to analyze the impact of equity risk on initial underpricing and they find that equity risk has significant explanatory power with respect to the initial underpricing of convertible debt issues.

## 4 Hypotheses of the study

**H1: Convertible debt offerings are less underpriced than IPOs of common stock but more underpriced than straight debt offerings.**

The only empirical evidence available of the underpricing of convertible debt offerings is the study conducted by Kang and Lee (1996) in the US market. Their paper revealed that the sample of 91 convertible debt offerings from the period 1988 – 1992 was, on average, underpriced by 1.11%. This is much less than the average underpricing in equity IPOs. For example, Ritter and Welch (2002) found an average underpricing result of 18.8% in a sample of 6,249 US IPOs from 1980 to 2001. Straight debt offerings, on the other hand, experience only marginal or no underpricing at all (Datta et al. 1997; Wasserfallen and Wydler 1988). Also issues of seasoned equity are found to be only slightly underpriced (Loderer et al. 1991). Kang and Lee (1996) argue that the size of underpricing is positively related to the amount of pricing-related information that is available to the market.

**H2: The amount of underpricing in convertible debt offerings is positively related with the size of the issue.**

The second hypothesis is the price pressure hypothesis. It states that investors are willing to absorb a large volume of new bonds only if a price discount is offered because the necessary portfolio reallocations involve transactions costs (Wasserfallen and Wydler 1988).

**H3: Convertible debt issues with higher bond ratings are associated with less underpricing than low rating issues.**

Datta et al. (1997) argue that since low grade debt contains a larger equity component than investment grade debt, the IPO returns of low grade debt should behave more like equity IPO returns. They also empirically find that IPOs of speculative grade debt are significantly underpriced at issue while investment grade IPOs are significantly overpriced at issue.

**H4: The amount of underpricing in convertible debt offerings has a negative relation with the age of the issuing company.**

Ritter (1991) argues that risky IPOs require higher average initial returns and that the age of the issuing firm is a proxy for that risk. Ritter also finds a strong monotonic relation between age and the initial return of IPOs. Following Ritter (1991) and Kang and Lee (1996) I take the age of the issuing firm as a proxy for ex ante uncertainty.

**H5: The amount of underpricing in convertible debt offerings is positively related with the standard deviation of the underlying stock.**

Ingersoll (1976) and Smith (1984; see Kang and Lee 1996, 240) identify the expected volatility of the firm's assets as an underlying parameter for the pricing of convertible bonds. Since the expected volatility is unobservable I take, following Kang and Lee (1996), the standard deviation of daily raw returns of the firm's common stock for the period from 220 to 20 trading days before the offering date as a proxy for ex ante uncertainty.

**H6: The amount of underpricing in convertible debt offerings is positively related with the beta of the underlying stock.**

The value of a convertible bond is at least as great as the maximum of its straight bond value and its conversion value. The conversion value, in turn, depends on the issuing company's equity value. Consequently, the systematic risk of equity contributes an additional risk factor to the new convertible debt issue. Following Kang and Lee (1996) I analyze the impact of

equity risk on the initial pricing with equity beta, which is estimated for the 200 trading day period ending one calendar month before the convertible debt issue.

**H7: The degree of underpricing in convertible debt offerings is inversely related to the underwriter's reputation.**

Carter and Manaster (1990) suggest that prestigious underwriters tend to be associated with lower risk initial public offerings. With less risk there is less incentive to acquire information and also the amount of uninformed investors is lower. Consequently, prestigious underwriters do not underprice to as great an extent.

**H8: Convertible debt offerings with a larger probability to conversion are related with higher underpricing.**

Datta et al. (1997) find that low grade debt IPOs are associated with larger underpricing than investment grade debt issues and they argue that this is due to the larger equity component embedded in the junk bonds. In other words, the larger the equity component, the more the issue is expected to behave like equity issues. Kuhlman and Radcliffe (1992) use a *CP ratio* as a proxy for the equity component for convertible bonds. The CP ratio is calculated as the conversion price divided by the stock price and derives from an option pricing argument which relates the value of a call option to the difference between stock price and exercise price. Kuhlmann and Radcliffe (1992) study abnormal convertible debt issue date stock returns and hypothesize that the larger the equity component in a CB issue the more the stock price reaction should be like in equity issues. The authors find that the equity component of the issue, measured by the probability of conversion (CP ratio), is positively related to the degree of impact experienced. This result is only marginally significant, though. Following the logic of Datta et al. (1997) and Kuhlmann and Radcliffe (1992) I hypothesize that convertible debt offerings related with larger CP ratios behave more like equity IPOs and are more underpriced than low equity component issues.

**H9: Convertible debt offerings experience larger underpricing in hot-issue markets.**

IPO markets tend to be cyclical. Some periods are "hot" and other periods are "cold" (Ibbotson et al. 1994). Benveniste and Spindt (1989) present the dynamic information acquisition model, which argues that regular investors, in order to truthfully reveal their demand to an underwriter during the bookbuilding phase of an IPO's marketing, must be rewarded with more underpricing on deals for which there is strong demand. Thus, in hot markets, where the demand of securities tends to be higher, larger first-day returns should

exist. This logic is applicable also to convertible debt offerings, since they are also priced as a result of a bookbuilding process. Loughran and Ritter (2002) provide a bargaining model in which underwriters want a lower offer price and issuing firms desire a higher offer price. Their prospect theory argues that when unexpectedly strong demand becomes apparent during the preselling period, issuing firms acquiesce in leaving more money on the table in the form of underpricing. When demand is unexpectedly weak, issuing firms negotiate more aggressively, implying less underpricing. Loughran and Ritter (2002) also find empirical evidence that IPOs are more underpriced after a rise in equity markets. Mann et al. (1999) study the popularity of convertible debt issues and find that also for convertible securities there exist "hot-issue markets", i.e. when equity markets have risen.

## 5 Sample data

### *5.1 Collection of the sample data*

The initial sample consists of all convertible debt offerings issued in Europe that are reported in the SDC Platinum database during the period October 1998 – September 2001. The end of the sample period is determined by including the latest convertible bonds that have one year performance data available. A total of 279 new issues of convertible debt were collected. This initial sample includes only one Finnish convertible debt offering, which is a 200 million euro issue done by SanomaWSOY in September 2001. To achieve a truly European perspective I exclude all offerings that are issued by a non-European company and/or have the underlying equity trading in a non-European stock exchange. These cases are possible in global offerings, where a Taiwanese firm, for example, issues convertible debt in the Luxembourg Stock Exchange. Also in exchangeable convertible debt offerings the underlying stock can be of a non-European listed company. In addition, I exclude those issues for which the closing price is not reported in Bloomberg for more than 30 calendar days after the offering.

Most of the data related to the convertible debt offerings such as exact issuance dates, maturity dates and prices at issuance and on the first trading day I collected from Bloomberg Professional™ service.[2] Also data related to the firms issuing the convertible bonds I assembled using Bloomberg Professional™.

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[2] I thank Nordea Securities Corporate Finance Oy for letting me use their Bloomberg Professional™ service.

*5.2 Descriptive statistics of the sample data*

The final sample consists of 105 European convertible bond offerings of which only 13 offerings are exchangeable bond issuances. Although Figure 2 shows that exchangeable bonds covered around 65 % of the total convertible bond issuance in 2001, exchangeable bonds frequently lacked adequate amount of price data in Bloomberg and were therefore excluded from the final sample. The amount of offerings in each country is shown in Figure 4. 35 of the sample convertible debt offerings were made in France and 22 in Luxembourg. These countries also account for over a half (€32.8 billion) of the total amount of €50.5 billion raised. The Netherlands and the United Kingdom had issuances in the range between 6 and 8 billion euros and the other countries in the sample were Germany, Switzerland, Italy and Finland with a total amount issued of under three billion euros in each country.

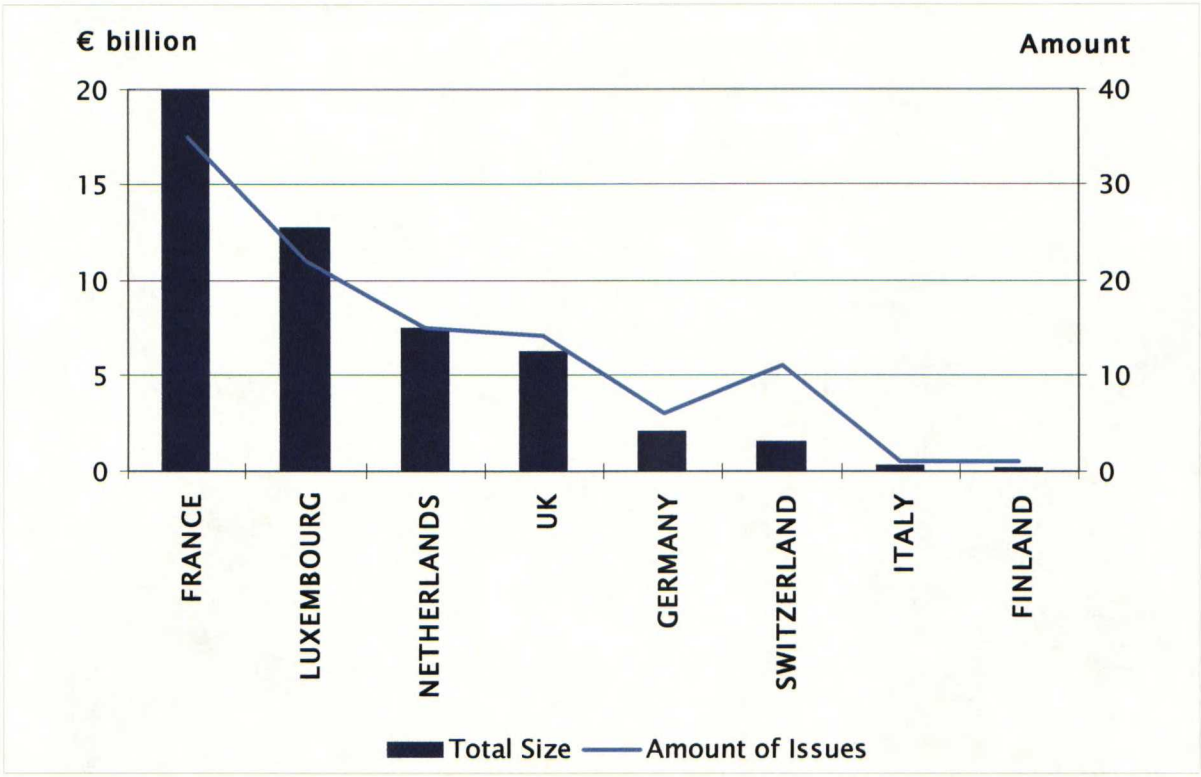


**Figure 4. The division of the convertible debt offerings by country.** The picture shows the amount of offerings and the total size of the issues in billions of euros in each country in the sample of 105 European convertible debt offerings in the period 10/1998 – 09/2001.

As can be seen from Figure 5 the bond ratings range from AA to CC on the Standard and Poor's scale. 49 issues (47%) are unrated and this amount corresponds with 26% of the total sample issuance. 36 convertible debt issues (34%) are investment grade (AA to BBB) and they amount up to €27.1 million (54% of the total amount).

Additional descriptive statistics for the final sample of convertible debt offerings is presented in Table III. The sizes of the offerings range from €11 million to €2.7 billion. The median of the issue size is €350 million. In comparison, the range of the sample of 91 American convertible debt offerings that were used in the study of Kang and Lee (1996) was between $30 and $3,200 million. The median issue size in their sample was $175 million, which is roughly a half of the median of the sample used in this thesis. The median issue size is 9.6% of the market value of the equity measured at the last day of the fiscal year preceding the offering. The median maturity for the sample issues is 5.1 years and the median period in which the issuer cannot call the debt is 3.0 years. The median coupon rate is 2.3% and the sample includes seven zero-coupon convertible debt offerings.

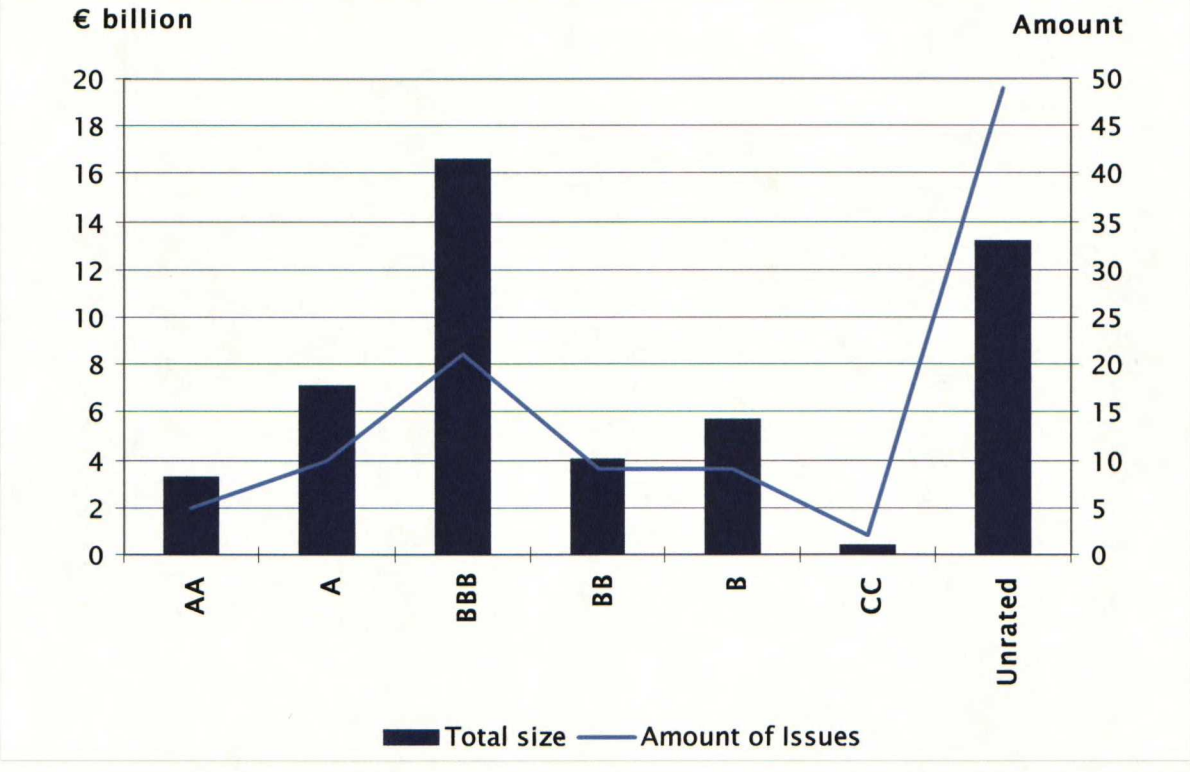


**Figure 5. Ratings of the convertible debt offering sample.** The ratings of the offerings are collected from the SDC Platinum database and Bloomberg Professional™. The sample of 105 European convertible debt offerings is rated from AA to CC on the Standard and Poor's scale. 49 of the offerings were not rated.

The last four rows in Table III describe characteristics of the issuing firms in the sample. Equity beta is estimated for the 200 trading day period ending one calendar month before the convertible debt issue. The market index used in beta calculations is the general index of the stock market, where the common stock is traded. In contrast to the US market, where convertible debt is usually issued by high-risk, high-growth and highly leveraged firms (Kang

and Lee 1996) and (Wright 2000) Table III shows that European convertible debt offerings are on average issued by firms with a low beta and debt ratio and with a median age of 30 years. The median yearly standard deviation of stock returns is 44.8% calculated from daily raw returns from 220 to 20 trading days preceding the issue date.

**Table III**
**Descriptive statistics for a sample of 105 European convertible debt offerings in the period 1998 - 2001**

| Variable | Sample size | Mean | Median | Minimum | Maximum |
|---|---|---|---|---|---|
| Issue size (€ millions) | 105 | 481 | 350 | 11 | 2 680 |
| Issue size/market value of equity[a] | 98 | 0.13 | 0.96 | 0.003 | 0.91 |
| Maturity (years) | 105 | 6.3 | 5.1 | 2.1 | 20.4 |
| Call protection period (years) | 97 | 3.3 | 3.0 | 0.0 | 7.0 |
| Coupon (%) | 105 | 2.3 | 2.0 | 0.0 | 6.0 |
| Equity beta[b] | 102 | 0.79 | 0.72 | -0.14 | 2.58 |
| Leverage ratio (total debt/total assets)[c] | 100 | 0.29 | 0.27 | 0.00 | 0.95 |
| Age of the issuing firm (years)[d] | 99 | 55 | 30 | 1 | 207 |
| Standard deviation of stock returns (%)[e] | 103 | 46.4 | 44.8 | 14.9 | 108.7 |

[a] Market value of equity is the market value at the end of the fiscal year preceding issue date.

[b] Equity beta is estimated with the Bloomberg Professional™ beta calculation tool. The period for which the beta is calculated is the 200 trading day period ending one calendar month before the convertible debt issue. The index against which the stock price is regressed is the market index of the issuer's home stock market. (CAC40 in France, DAX in Germany etc.)

[c] Total debt and total assets are based on the values at the end of the fiscal year preceding issue date

[d] Age of the issuing firm is calculated as year of issuance minus year of incorporation.

[e] Standard deviation is calculated using daily raw returns from 220 to 20 trading days before issue date.

# 6 Methods

## *6.1 Initial raw return*

The methods used in this study follow the methodology of Kang and Lee (1996). The first return measure calculated for each convertible debt offering is the initial raw return ($R_1$). This is defined as the return from buying at the offer price and selling at the closing market price on the first day of public trading,

$$R_1 = \left[ \frac{P_t}{P_{offer}} - 1 \right] \times 100\%, \qquad (1)$$

where $P_t$ is the closing market price on day t (t = 1 is the issue day) and $P_{offer}$ is the offer price. For quite a few of the convertible bonds the first price quote available in Bloomberg Professional™ was days after the offering. The median delay from the issue day to the first reported price in Bloomberg was 8 days. Kang and Lee (1996) experienced similar problems with their sample of 91 US market convertible debt offerings and they had a median delay of six days. They argue that this delay could be due to the fact that underwriters are motivated to withhold the price quotes so as to have larger bid-ask spreads than otherwise.

## *6.2 Initial excess return*

Initial excess return ($RE_1$) is measured using the euro denominated UBS Warburg European Convertible Index. On September 29, 2002 the index had 193 constituents. This index is available also divided into speculative grade/not rated and investment grade indices. Kang and Lee (1996) argue that the speculative grade and investment grade convertible bond markets are different by including a totally different investor base, for example. Therefore, they use different indices on the basis of debt rating in calculating the excess initial return. I shall also use the two different indices from UBS Warburg. The index values are set at 100 on September 30, 1998 and values are available from June 30, 1995. The performances of the convertible indices and a general European stock market index (S&P Europe 350) for the period Oct 1, 1998 – April 22, 2002 are presented in Figure 6. The shaded area describes the sample period (Oct 1, 1998 – Sep 30, 2001). It is noteworthy that the sample period includes both bullish and bearish stock markets.

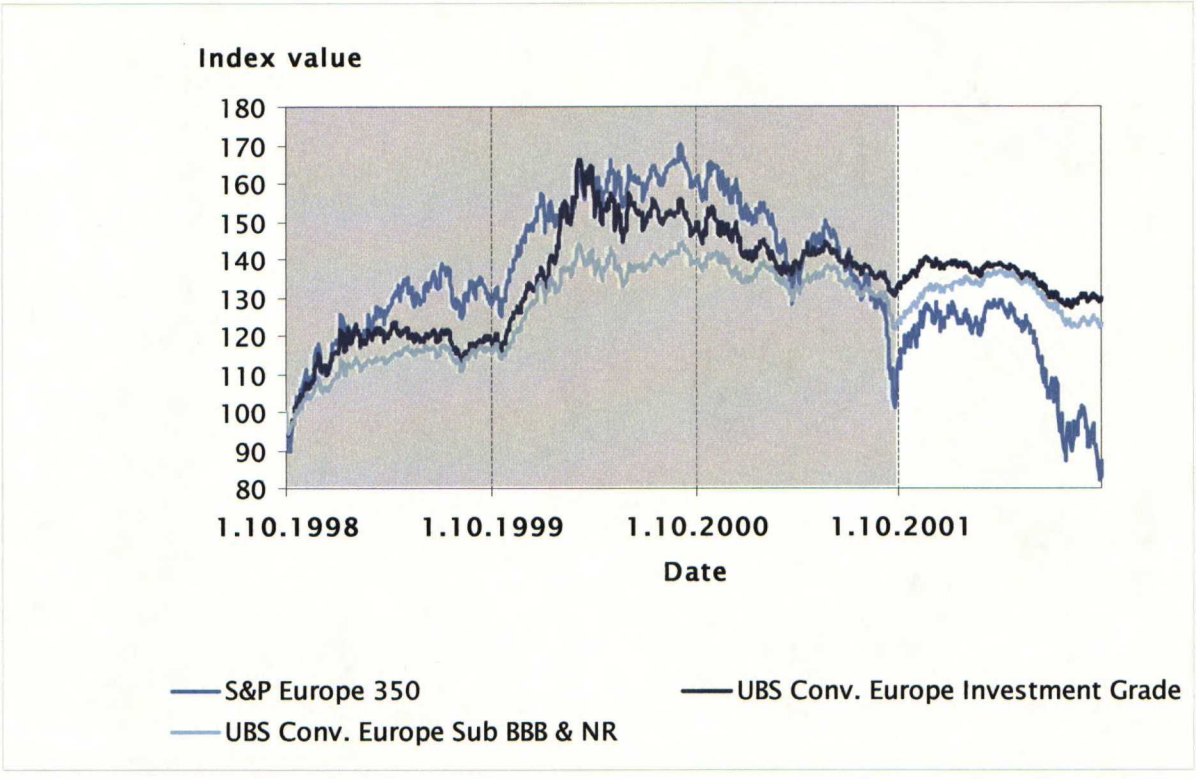


**Figure 6. The development of the UBS Warburg European Speculative and Investment Grade Convertible Indices vs. the S&P Europe 350 stock market index.** UBS Warburg European Convertible Indices consist of all European convertible debt issues of at least $100 million of market capitalization. The values of the indices are set at 100 on September 30, 1998. The time period above is October 1, 1998 – September 26, 2002. The S&P Europe 350 Index measures the performance of equities in 16 Pan-European markets, covering approximately 70 percent of the market capitalization. The values of the S&P Europe 350 have been scaled so that they start from 100 at September 30, 1998. The shaded area describes the sample period from Oct 1, 1998 to Sep 30, 2001. Source: Bloomberg Professional™ and Standard & Poor's website.

The initial excess return is calculated by subtracting the UBS Warburg European Speculative or Investment Grade Convertible Index return from the initial raw return,

$$RE_1 = R_1 - \left[\left(\frac{CBI_t}{CBI_0} - 1\right) \times 100\%\right], \tag{2}$$

where $CBI_t$ is the UBS Warburg European Convertible Index value on day t (t = 1 is the issue day) and $CBI_0$ is the value of the index on the day preceding the issue.

### *6.3 Statistical methods*

All statistical calculations and tests are conducted with the SPSS 10.1 computer program. All mean returns are tested with the Student's t-test whether they differ from zero. For comparison, median returns are also calculated and their difference from zero is tested with the Wilcoxon signed ranks test. The Kolmogorov-Smirnov test is used to test whether the

initial returns are normally distributed. Linear correlation between different variables is analyzed by calculating the Pearson correlations. In addition, multivariate regression analysis is used to estimate the explanatory power of the most significant variables into the initial pricing of convertible debt offerings.

## 7 Results

This section examines the initial pricing of the sample European convertible debt offerings with statistical methods. In 7.1 the initial pricing is studied in general. In 7.2 possible reasons for the initial pricing is examined. Section 7.3 combines the four most significant explanatory variables in regression analysis and the last section looks at the one-year performance of the convertible bonds.

### *7.1 Initial returns*

This section examines the first hypothesis and presents the results for the initial pricing of European convertible debt offerings. Histograms for the initial returns are presented in Figure 7 and the corresponding frequency table can be found Appendix I. The initial raw returns fall in the range from -5% to +13% and the initial excess returns in the range from -5% to 11% with one exception. The 5-year convertible bond with a coupon rate of 4% from Augusta Technologie AG issued on 4 February 2000 experienced a remarkable 20.79% raw and a 20.35% excess return on the first day of public trading (11 days after the issuance). The company states in a press release concerning the issue (Augusta Technologie AG 2000) that the price was set at the upper end of the bookbuilding range due to great demand. Still, the first trading price hiked over 20%. In addition, the issuance date is exactly seven months before the S&P Europe 350 index reached its all time high at 1690.69 (see also Figure 6). On the issuance date the index had a value of 1522.47. For comparison, the index was valued at 918.63 on 17 October 2002. The Augusta convertible issue is, therefore, a good example of how the "techno boom" affected not only the equity markets but also the (equity-linked) convertible bond markets.

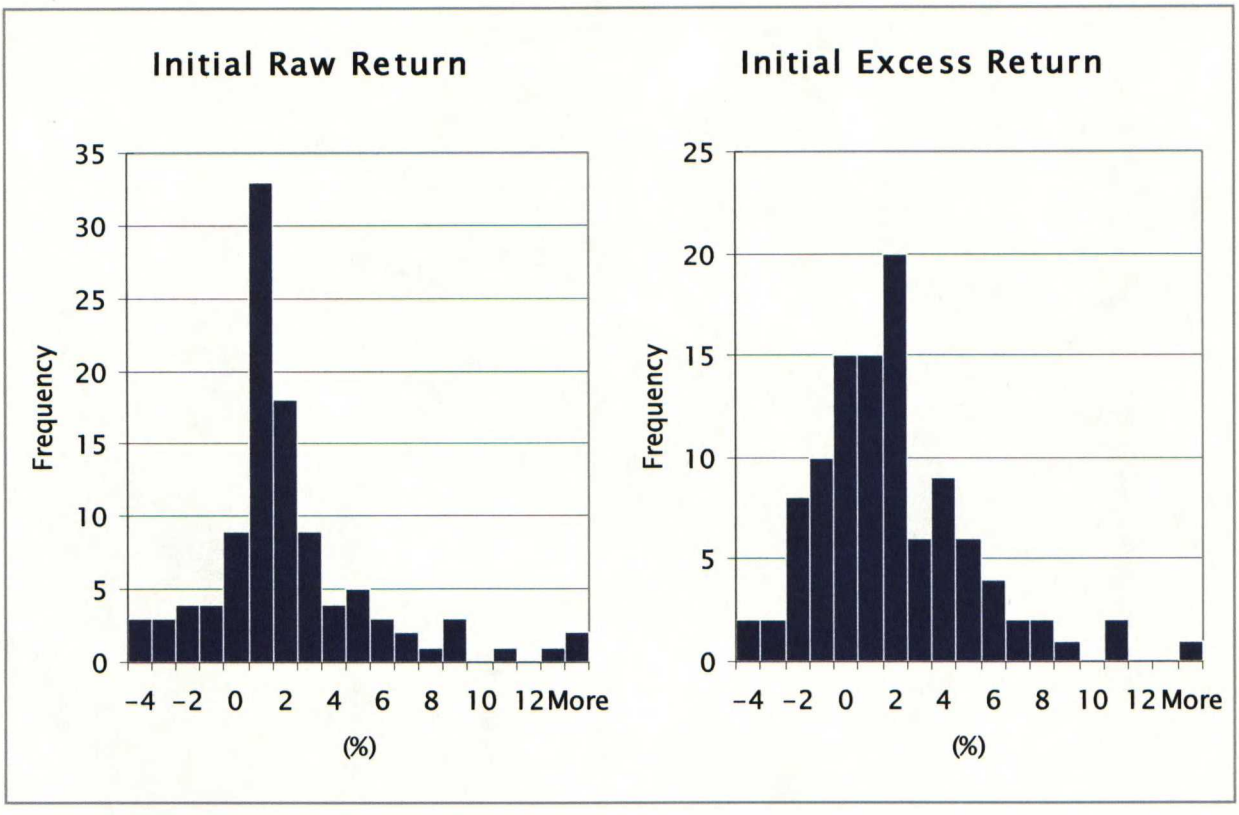


**Figure 7. Histograms for percentage initial raw and excess returns.** Initial raw return ($R_1$) is the return from buying at the offer price and selling at the closing market price on the first day of public trading. Initial excess return is the market adjusted return defined as $R_1$ minus the corresponding UBS Warburg European Convertible Index return. Histograms describe the sample of 105 European convertible debt offerings in the period 1998 – 2001.

From the histograms it seems that both the initial raw returns and the initial excess returns are quite well normally distributed. This is an important feature of the initial returns, since most of the statistical tests are based on the premise that the variable is normally distributed (Heikkilä 1998). I conduct also Kolmogorov-Smirnov tests (Appendix II) on both variables to verify the normality of the initial returns. The p-values for the initial raw and excess return are 0.003 and 0.076, respectively. This result implies that the initial excess returns are normally distributed, but the initial raw returns are not. Therefore, the statistical tests that assume normality might give somewhat misleading results for the initial raw returns.

Summary statistics of the initial returns for the full sample of 105 European convertible debt offerings are in Table IV. The mean initial raw return ($R_1$) for the full sample is 1.56% and this result is significantly different from zero at the 0.1% significance level (Appendix II). The median initial raw return is lower than the mean, 0.50% and the Wilcoxon sign rank test indicates that this is also different from zero at 0.1% significance level (Appendix III). 17

issues out of 105 (16.2% of the sample) had an initial raw return of exactly zero and 82 issues (78.1%) had non-negative initial raw returns.

**Table IV**
**Summary statistics on the percentage initial raw and excess returns for a sample of 105 European convertible debt offerings in the period 1998 - 2001**

$R_1$ is the return from buying at the offer price and selling at the closing market price on the first day of public trading. $RE_1$ is the market adjusted return defined as $R_1$ minus the corresponding UBS Warburg European Convertible Index return. Percent positive is the percentage of positive returns. In 17 samples (16.2%) the initial raw returns were exactly zero, which are considered positive. P-value describes the significance level in a 2-tailed t-test. *** indicates significance of the Wilcoxon sign-rank test at the 0.1% level.

| | Mean return (p-value) | Median return | Minimum return | Maximum return | Percent positive |
|---|---|---|---|---|---|
| Initial raw return ($R_1$) (%) | 1.56 (0.000) | 0.50*** | -4.75 | 20.79 | 78.1 |
| Initial excess return ($RE_1$) (%) | 1.43 (0.000) | 1.03*** | -4.63 | 20.35 | 64.8 |

The results are similar using initial excess returns $RE_1$ (Table IV). The mean and median convertible bond market-adjusted returns are 1.43% and 1.03%, respectively. Both the mean and median are significantly different from zero at the 0.1% level (Appendices II and III). 68 offerings (64.8% of the sample) have a non-negative initial excess return.

As mentioned in the introduction, the average IPO leaves $9.1 million on the table according to Loughran and Ritter (2002). The median amount is only $2.3 million though. To apply this to convertible debt offerings the money left on the table is defined as the initial raw return times the size of the issue. For the sample of 105 European convertible debt offerings the average amount of money left on the table is €6.4 million and the median is €1.0 million. This implies that similarly to IPOs most of the money left on the table comes from a minority of convertible debt offerings. It is also interesting to see that the amount of money left on the table in convertible debt offerings is not remarkably lower than in IPOs. Although the percentage initial underpricing is much lower in convertible debt offerings, the average size of the CDOs is much larger.

### *7.1.1 Initial returns in different countries*

The sample size of 105 gives also the possibility to look at the mean initial returns in different countries separately. Figure 8 shows the mean initial raw and excess returns in each country and more detailed information can be found in Appendix IV. The sample includes only one

Finnish and one Italian convertible debt issue so their average initial return values are not that meaningful, though.

Figure 8 shows that Germany has the highest mean initial returns. This is most likely due to the fact that the Augusta convertible bond with a 20.35% initial excess return is included in the sample's six German convertible debt issues and, therefore, distorts the results upwards. The Netherlands, France, Luxembourg and the United Kingdom have at least 14 issues each in the sample it is meaningful to compare the mean initial returns in these four countries. France and Netherlands have mean initial returns between 2% to 3%. In Luxembourg and UK, on the other hand, the mean initial returns lie around 0% to 0.5%.

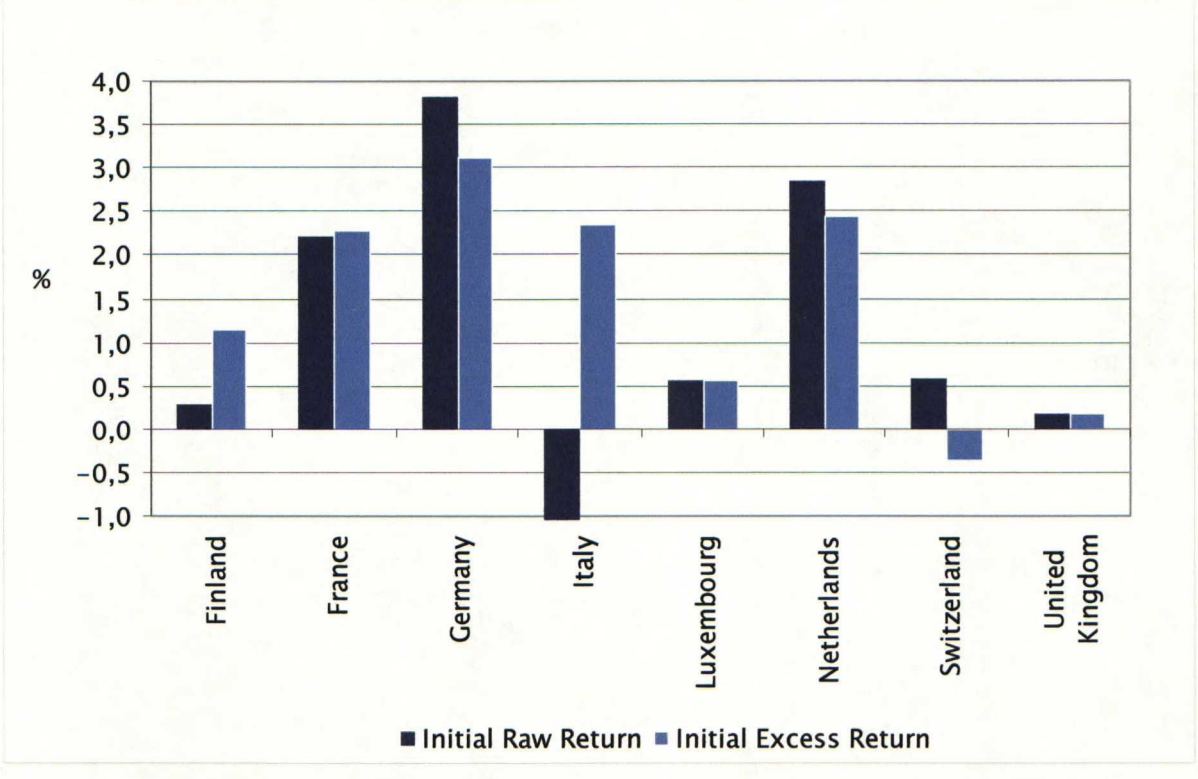


**Figure 8. Initial mean raw and excess returns by country of issuance.** Initial raw return ($R_1$) is the return from buying at the offer price and selling at the closing market price on the first day of public trading. Initial excess return is the market adjusted return defined as $R_1$ minus the corresponding UBS Warburg European Convertible Index return. The results above are from a total sample of 105 European convertible debt offerings in the period 1998 – 2001.

To measure the statistical significance of the difference in the initial returns I conduct a t-test for the equality of mean initial returns of bonds issued in France and Luxembourg. These two countries are chosen, because of the adequate sample size (33 in France and 22 in Luxembourg). The results of the tests can be found in Appendix V. Indeed, the results show that the mean initial raw ($p = 0.010$) and excess ($p = 0.012$) returns in France and

Luxembourg differ from each other. The initial underpricing of convertible debt offerings seems, therefore, to be heavier in France than in Luxembourg.

### *7.1.2 Initial returns in different time periods*

The sample period includes three years starting from 1 October 1998. The mean initial excess and raw returns during one-year periods are displayed in Figure 9. The diagram shows that the middle-year 10/1999 – 9/2000 has clearly included more underpricing in convertible debt offerings than the other two periods. Figure 6 shows that the end of September 2000 was also the end of the stock market rush and the "techno boom". The first two years of the sample period included a roughly similar stock market hike. It seems from Figure 9, therefore, that the initial underpricing of European convertible debt offerings was at the highest level during the last year of the bullish stock market. During the last year of the sample period underpricing fell lower than it had been during the first two years. This result is quite logical in the light of the huge initial IPO returns during the second year of the sample period. The difference in means test does not indicate a significant difference between the mean initial excess returns of either the first and second year or the second and third year, though.

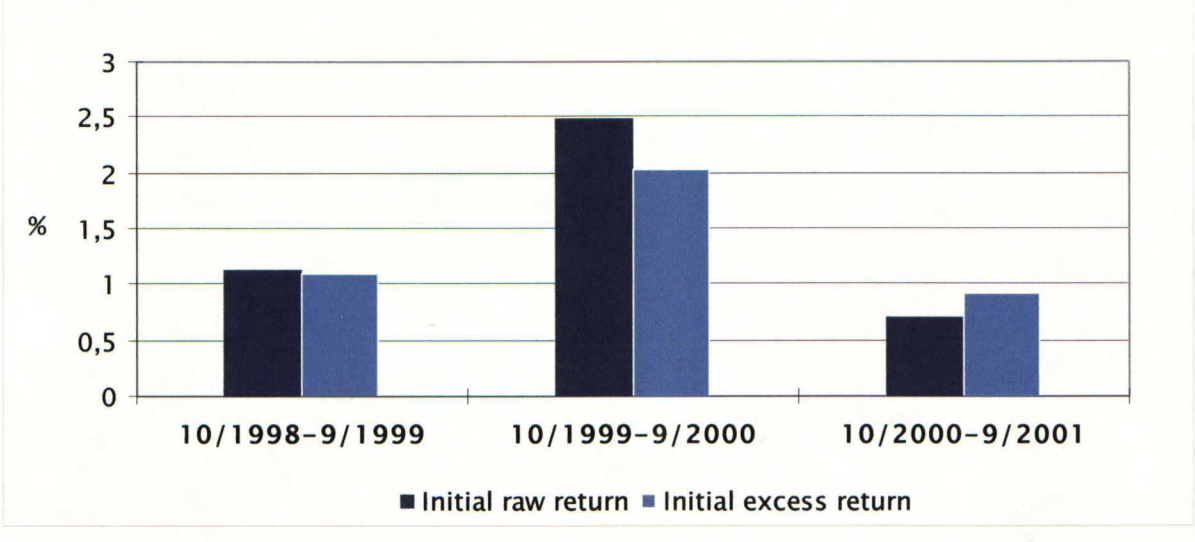


**Figure 9. Initial mean raw and excess returns in different time periods for a sample of 105 European convertible debt offerings in the period 1998 - 2001.** The initial excess return is the initial raw return minus the corresponding UBS Warburg European Convertible Index return. The initial raw return is the return from buying at the offer price and selling at the closing market price on the first day of public trading.

### *7.1.3 Initial returns by issue characteristics*

This section explores the possible relatedness of issue characteristics to the initial underpricing of convertible debt offerings. Specifically, the second and third hypotheses are tested.

Table V shows initial excess returns ($RE_1$) divided into various subsamples. The first division is by issue size. The issue size is the euro denominated (in millions) amount of proceeds of the issue before a possible exercise of the over-allotment (greenshoe) option. Since the greenshoe is possibly exercised after the issue is initially priced, it is more reasonable to use the amount without the greenshoe. Both the mean and the median initial excess return appear to grow with the issue size. Returns also tend to be more often positive in larger issues. In addition, the significance that the mean or median differs from zero seems to increase with size class. I exclude the Augusta convertible (outlier) from the sample and calculate the Pearson correlation between issue size and initial excess return in Table VI. The result is only 0.043 and the result is insignificant (p-value 0.662) so there isn't any statistically significant linear correlation between issue size and initial excess return. Figure 14 in Appendix VI visualizes this fact. The result is qualitatively the same using the logarithm of issue size instead of the size of the issue. I also calculate the correlations separately in each market of issuance and find that in the United Kingdom (N = 14) there is a strong positive correlation between the issue size and initial excess return. The Pearson correlation is 0.585 with a p-value of 0.028. The scatter diagram (Figure 15) for the UK sample is in Appendix VI. In the United Kingdom, using the logarithm of the issue size increases the correlation to 0.663 and lowers the significance level to 1%.

**Table V**

**Summary statistics on the percentage initial excess returns for a sample of 105 European convertible debt offerings in the period 1998 – 2001 by issue characteristics**

The initial excess return is the initial raw return minus the corresponding UBS Warburg European Convertible Index return. The initial raw return is the return from buying at the offer price and selling at the closing market price on the first day of public trading. Percent positive is the percentage of positive returns. P-value describes the significance level in a 2-tailed t-test. ***, ** and * indicate significance of the Wilcoxon sign-rank test at the 0.1%, 1% and 5% levels, respectively.

| | Sample size | Mean return (p-value) | Median return | Min return | Max return | Percent positive |
|---|---|---|---|---|---|---|
| *Issue size* | | | | | | |
| ≤ €200M | 37 | 1.38 (0.069) | 0.43 | -4.63 | 20.35 | 56.8 |
| €201M - €500M | 39 | 1.41 (0.008) | 0.90* | -4.00 | 10.63 | 66.7 |
| > €500M | 29 | 1.50 (0.002) | 1.68** | -4.08 | 5.98 | 72.4 |
| *Maturity* | | | | | | |
| ≤ 5 yrs | 17 | 2.27 (0.007) | 1.88* | -1.17 | 8.55 | 70.6 |
| 5 - 10 yrs | 77 | 1.33 (0.002) | 1.03** | -4.63 | 20.35 | 63.6 |
| > 10 yrs | 11 | 0.75 (0.362) | 0.72 | -4.08 | 5.37 | 63.6 |
| *Bond rating* | | | | | | |
| Investment grade (AAA to BBB) | 36 | 1.39 (0.002) | 1.51** | -2.68 | 6.19 | 63.8 |
| Speculative grade (BB to C) or unrated | 69 | 1.44 (0.003) | 0.88** | -4.63 | 20.35 | 66.7 |
| *Coupon rate* | | | | | | |
| Zero-coupon | 7 | -1.25 (0.062) | -1.14* | -4.08 | 0.53 | 14.3 |
| 0% - 1.5% | 38 | 1.27 (0.002) | 0.67** | -2.68 | 7.18 | 71.1 |
| 1.5% - 3.0% | 29 | 2.05 (0.002) | 1.78** | -4.63 | 10.29 | 75.9 |
| > 3.0% | 31 | 1.63 (0.066) | 0.90 | -4.00 | 20.35 | 58.1 |

Testing the price pressure hypothesis only with linear correlation between initial underpricing and issue size might not be adequate. The reason is that large issues are probably associated with large issuers, which might imply less risky offerings and more pricing related information on the market. This would indicate less underpricing. To take this into account I conduct regressions using the firm size as a control variable in Table VII. In addition, issue size divided by firm size is used as an independent variable. Although the independent

variable issue size does not show any significance, the issue size divided by the firm size shows slight significance. The sign of the coefficient (5.98) is also positive, as expected. In the third regression the issue size divided by the firm size variable gets a p-value of 0.066 and 3.5% explanatory power measured with $R^2$. The regression does imply, therefore, modest support for H2, the price pressure hypothesis.

**Table VI**

**Pearson correlations between issue characteristic variables**

The initial excess return is the initial raw return minus the corresponding UBS Warburg European Convertible Index return. The initial raw return is the return from buying at the offer price and selling at the closing market price on the first day of public trading. Rating is an indicator variable that takes a value of one if the convertible issue is rated investment grade and a value of zero if the issue is speculative grade or does not have a rating. The value above is the correlation factor and the value in brackets indicates the significance of the correlation factor. *** indicates significance at the 0.1% level. The sample data excludes the Augusta convertible with a 20.35% initial excess return.

| | **Initial raw return** | **Initial excess return** | **Issue size** | **Log of issue size** | **Maturity** | **Rating** | **Coupon rate** |
|---|---|---|---|---|---|---|---|
| **Initial raw return** | 1 | | | | | | |
| **Initial excess return** | 0.860*** (0.000) | 1 | | | | | |
| **Issue size** | -0.025 (0.803) | 0.043 (0.662) | 1 | | | | |
| **Log of issue size** | -0.091 (0.357) | -0.017 (0.861) | 0.814*** (0.000) | 1 | | | |
| **Maturity** | -0.060 (0.544) | -0.064 (0.518) | 0.133 (0.177) | 0.146 (0.140) | 1 | | |
| **Rating** | 0.022 (0.822) | 0.037 (0.707) | 0.373*** (0.000) | 0.451*** (0.000) | 0.032 (0.748) | 1 | |
| **Coupon rate** | 0.048 (0.630) | 0.039 (0.693) | -0.089 (0.368 | -0.079 (0.426) | -0.119 (0.231) | -0.029 (0.772) | 1 |

The initial excess returns in different maturity classes as presented in Table V seem to follow a declining pattern with a growing maturity. The significance of this result is quite modest, though, since the sample sizes in the smallest and largest maturity classes are small. In fact, 62 convertible bond issues (59% of the sample) had a time to maturity in between 5 and 6 years. The scatter diagram in Appendix VII visualizes this fact. As the Pearson correlation between time to maturity and initial excess return is also very small (-0.034) and insignificant (p-value 0.734) I conclude that there is no relation between the time to maturity and the initial excess return. This result is similar in all countries.

**Table VII**

**Regressions of the initial excess returns of convertible debt offerings on issue size related variables**

The initial excess return is the initial raw return minus the corresponding UBS Warburg European Convertible Index return. The initial raw return is the return from buying at the offer price and selling at the closing market price on the first day of public trading. Firm size is calculated as the market value of equity at the end of the accounting period preceding the issue plus the book value of debt at the same date. Numbers in parentheses are p-values. ** indicates significance at the 1% level. The sample data excludes the Augusta convertible with a 20.35% initial excess return and seven other issues due to insufficient data.

| | Regressions | | |
|---|---|---|---|
| Variables | (1) | (2) | (3) |
| Intercept | 1.10** | 0.723 | 0.670 |
| | (0.010) | (0.664) | (0.113) |
| Issue size | $4.75 \cdot 10^{-4}$ | | |
| | (0.491) | | |
| Logarithm of issue size | | 0.643 | |
| | | (0.222) | |
| Issue size/firm size | | | 5.98 |
| | | | (0.066) |
| Firm size | $-4.57 \cdot 10^{-6}$ | | |
| | (0.534) | | |
| Logarithm of firm size | | -0.371 | |
| | | (0.223) | |
| F-ratio | 0.30 | 0.822 | 3.45 |
| | (0.742) | (0.443) | (0.066) |
| $R^2$ (%) | 0.6 | 1.7 | 3.5 |
| Sample size | 97 | 97 | 97 |

To investigate the third hypothesis, the relation between default risk and initial underpricing, the initial excess returns are calculated separately for investment and speculative grade convertible bond issues in Table V. Convertible issues without a rating are included in the speculative grade bond group. With the full sample the mean initial excess returns in both groups are almost equal (1.4%). The medians indicate that investment grade bonds are slightly more underpriced than junk bonds, though. After removing the Augusta convertible (outlier) from the sample the initial excess returns for the investment and speculative grade bonds are 1.39% and 1.16%, respectively. According to a difference in means test for equal variances these mean initial excess returns are not significantly different from each other. In addition the correlation between the indicator variable *Rating*, which receives a value of one if the issue is investment grade and a value zero if the issue is speculative grade or not rated, and initial excess return is only 0.037 and insignificant. Therefore, the hypothesis that

investment grade convertible bonds would initially be less underpriced than junk bonds does not receive support.

The last division of initial excess returns in Table V is by coupon rate. From the results it is difficult to find any pattern other than that zero-coupon convertibles seem to be overpriced, on average. The correlation between initial excess return and coupon rate as shown in Table VI is also small (0.043) and insignificant (p-value of 0.662). Similar results are observed in all countries separately. Kang and Lee (1996) argue that zero-coupon convertibles are the most debt like of all convertibles because the conversion price is typically the highest. This would imply lower initial underpricing for zero-coupon convertibles following the logic that straight debt IPOs are significantly less underpriced than equity IPOs. Since the European sample used in this study includes only seven zero-coupon convertible issues, any statistically significant conclusions cannot be drawn.

### *7.2 Possible explanatory variables*

This section evaluates the role of possible explanatory variables in the initial pricing of European convertible debt offerings. Specifically, hypotheses 4 – 9 are tested.

#### *7.2.1 The age of the issuing company*

The fourth hypothesis predicts a negative relation between the age of the issuer and the initial underpricing of convertible debt offerings. The age of the issuing company acts as a proxy for uncertainty considering the market clearing price of the issue. Age is calculated as the year of the offering minus the year of incorporation. Kang and Lee (1996) use the natural logarithm of age in linear regression models so I have taken the logarithm of age as well for comparison. The scatter diagrams in Figure 10 visualize that the initial excess returns of European convertible debt offerings are not related with the age of the issuing firm. The correlation factors between the initial excess return and the age variables are negative, as expected, but insignificant. This result is qualitatively the same in all countries separately.

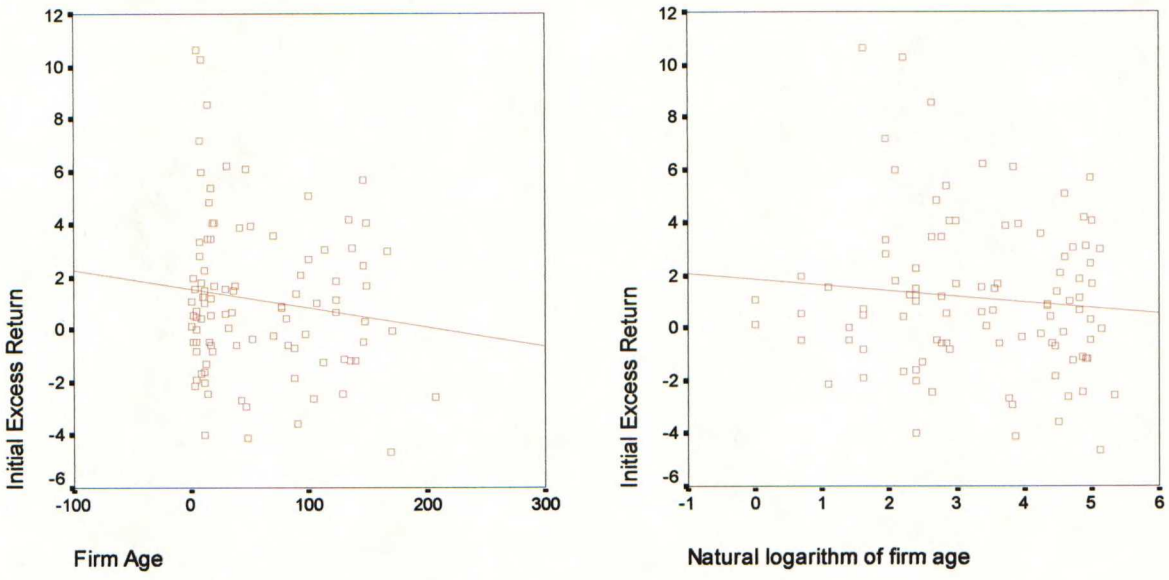


**Figure 10. The relationship between initial excess return and issuing firm age in the sample of 104 European convertible debt offerings.** The initial excess return is the initial raw return minus the corresponding UBS Warburg European Convertible Index return. The initial raw return is the return from buying at the offer price and selling at the closing market price on the first day of public trading. The age of the firm is calculated as the year of the offering minus the year of incorporation. The scatter diagrams exclude the Augusta convertible with a 20.35% initial excess return.

### *7.2.2 Standard deviation of stock returns*

The fifth hypothesis predicts a positive relation between the standard deviation of the underlying stock and the initial underpricing of convertible debt offerings. The standard deviation of stock returns (volatility) is calculated from daily returns for the period from 220 to 20 trading days before the offer date. This volatility is also considered as a proxy for uncertainty related to the market clearing price of the issue. Higher volatility, therefore, implies higher underpricing. The empirical data depicted in the form of a scatter diagram in Figure 11 gives very modest support to this hypothesis. The volatility of stock returns seems to slightly relate with the initial excess return. The Pearson correlation between initial excess return and volatility is positive (0.181), as expected, and the p-value is 0.069 implying almost significant positive relation between the initial excess return and volatility of the issuing firm's stock price.

An odd result is found when separating the sample by country of issuance. The 14 UK convertible issues are shown as darker dots in Figure 11. A clear declining pattern can be observed implying larger underpricing with riskier issues. Correlation between the variables is a strong -0.743 at a 1% significance level. This phenomenon is difficult to explain since it is

against the theoretical background. A somewhat probable explanation would be the small sample size ( N = 14), which can give misleading results.

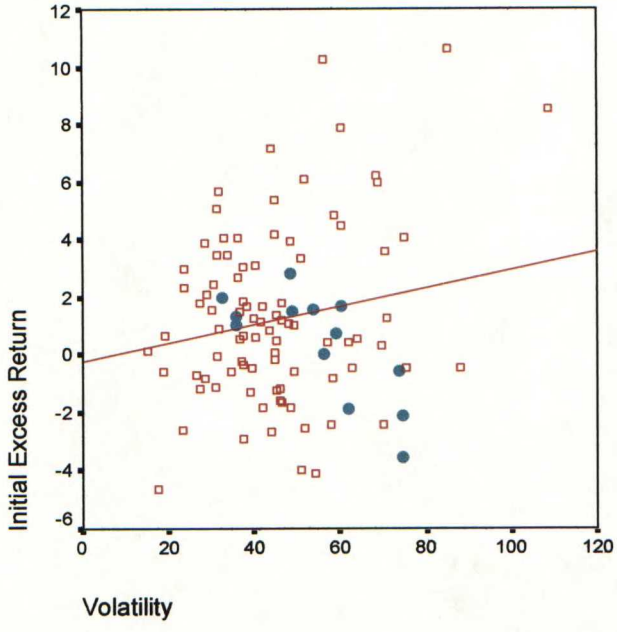


**Figure 11. The relationship between initial excess return and the standard deviation of daily returns of the underlying equity in the sample of 104 European convertible debt offerings.** The initial excess return is the initial raw return minus the corresponding UBS Warburg European Convertible Index return. The initial raw return is the return from buying at the offer price and selling at the closing market price on the first day of public trading. The volatility of the underlying stock is calculated from daily returns for the period from 220 to 20 trading days before the offer date. The darker dots represent the convertible debt offerings issued in the UK. The sample excludes the Augusta convertible with a 20.35% initial excess return.

### *7.2.3 Systematic risk of equity*

Equity beta is used to explain the impact of equity risk on initial underpricing of convertible debt offerings in the sixth hypothesis. Again I start with visual examination and present the scatter diagram between beta and initial excess return in Figure 12. This does not show any relation. The correlation between the two variables is positive (0.066), as expected, but insignificant so there is no linear relation between the initial excess return of convertible debt offerings and equity beta in the European sample used. This result stays qualitatively the same when the sample is partitioned by countries of issuance.

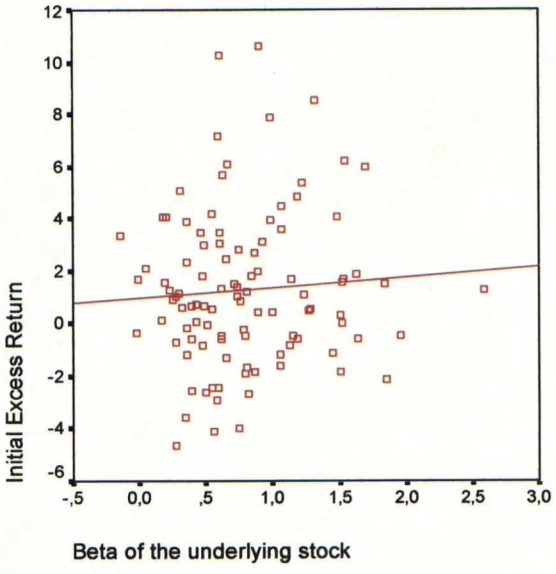


**Figure 12. The relationship between initial excess return and the beta of the underlying equity in the sample of 104 European convertible debt offerings.** The initial excess return is the initial raw return minus the corresponding UBS Warburg European Convertible Index return. The initial raw return is the return from buying at the offer price and selling at the closing market price on the first day of public trading. Equity beta is estimated with the Bloomberg Professional™ beta calculation tool. The period for which the beta is calculated is the 200 trading day period ending one calendar month before the convertible debt issue. The index against which the stock price is regressed is the market index of the issuer's home stock market. (CAC40 in France, DAX in Germany etc.). The sample excludes the Augusta convertible with a 20.35% initial excess return.

### *7.2.4 Underwriter reputation*

This section tests the seventh hypothesis, which states that the degree of underpricing in convertible debt offerings is inversely related to the underwriter's reputation. This thesis uses the list of underwriter rankings constructed by Loughran and Ritter (2001), which uses data from the late 1990's and, therefore, fits bets to this study with a sample period of 1998 - 2001. Loughran and Ritter (2001) have started with the previous rankings by Carter and Manaster (1990) and Carter et al.(1998). These rankings have then been modified using more recent data available. The rankings are assigned on the basis of information found in tombstones published on the covers of IPO prospectuses. The higher and more often the underwriter appears in the tombstones studied the higher the given ranking is. More detailed description of the ranking process can be found in the three above-mentioned studies.

The sample is divided into two subgroups, prestigious and non-prestigious. The first group consists of issues with a ranking of 9 on a 0 – 9 scale corresponding to the convertible debt issues with the most prestigious investment banks as underwriters. The second group includes the rest of the issues. It is noteworthy that the same convertible debt issue can include several

banks as underwriters called *co-lead managers*. The ranking in these cases is assigned according to the first underwriter mentioned in the SDC database.

The differences of the initial returns in the two groups are quite clear according to the results in Table VIII. The mean initial excess return for the prestigious underwriter group is 0.69%. For the non-prestigious group, the mean is 1.70%. In addition, the mean initial excess return in the non-prestigious group is very significantly different from zero with a p-value of 0.000. The mean does not significantly differ from zero in the prestigious group. Similar results are achieved using initial raw returns. A boxplot diagram in Appendix VII visualizes the differences between the initial excess returns in the two groups. From the diagram it is worth noting that convertible debt offerings underwritten by prestigious underwriters not only have lower median initial excess return but they are also more concentrated around the median. A difference in means test for equal variances, though, gives a p-value of only 0.079 for the inequality of the mean initial excess returns.

**Table VIII**

**Initial percentage returns divided into subsamples by underwriter prestigiousness**

The initial excess return is the initial raw return minus the corresponding UBS Warburg European Convertible Index return. The initial raw return is the return from buying at the offer price and selling at the closing market price on the first day of public trading. Prestigious underwriters include underwriters with a ranking of 9 on a 0 – 9 scale. Other underwriters are classified as non-prestigious. Rankings are based on Loughran and Ritter (2001). Percent positive is the percentage of positive returns. P-value describes the significance level in a 2-tailed t-test. ***, ** and * indicate significance of the Wilcoxon sign-rank test at the 0.1%, 1% and 5% levels, respectively. The sample data excludes the Augusta convertible with a 20.35% initial excess return.

| **Initial raw return** | Mean return (p-value) | Median return | Min return | Max return | Percent positive |
|---|---|---|---|---|---|
| Prestigious (N = 47) | 0.74 (0.079) | 0.16 | -4.75 | 13.00 | 74.5 |
| Non-prestigious (N = 57) | 1.90 (0.000) | 1.39*** | -4.62 | 12.00 | 80.7 |
| **Initial excess return** | | | | | |
| Prestigious (N = 47) | 0.69 (0.075) | 0.53 | -4.08 | 10.63 | 57.4 |
| Non-prestigious (N = 57) | 1.70 (0.000) | 1.14*** | -4.63 | 10.29 | 70.2 |

### *7.2.5 Probability of conversion*

The eighth hypothesis predicts a positive relation between the probability to conversion and the initial underpricing of convertible debt offerings. The probability of conversion of the convertible bond is measured with the CP ratio as described in section 4. The CP ratio is

calculated as the conversion price divided by the underlying stock price at one day before the issue. This ratio is used as a proxy for the equity component of the convertible bond. A larger CP ratio implies a smaller probability of conversion, which implies a larger equity component in the convertible bond.

The average CP ratio for the whole sample is 1.25, which means that the conversion price of the sample convertible debt issues, on average, was set at 25% above the stock price at issue. The Pearson correlation between the initial excess return and the CP ratio is 0.046 with a p-value of 0.649. In addition, the correlation between the CP ratio and the initial raw return is negative (and insignificant). Therefore, the CP ratio does not seem to have any relation with the initial pricing of the convertible debt offerings.

### *7.2.6 Market sentiment*

In this section the ninth hypothesis, the relation between the market sentiment and initial underpricing, is examined. *Hot-issue market* is defined as a period, in which equity markets have risen. In this thesis the S&P Europe 350 Index, which was presented earlier in Figure 6, represents the equity market. Gong and Shekhar (2001) proxy the market sentiment with a 30-trading day pre issue return. Here, a period of 60 trading days before the issue and a 30-trading day period ending 30 trading days before the issue are also used.

Following Loughran and Ritter (2002) I first divide the sample convertible debt offerings into three categories by the pre-issue market return in Figure 13. The development of the initial return is clear. The mean initial excess return in the category, where the stock market has declined during the 60 days before the issue, is only 0.53% and not significantly different from zero. The mean initial return rises to 1.3% and 2.3% as the pre-issue market return climbs to the range 0.0% - 6.0% and over 6.0%, respectively. Using the money left on the table concept, which was described in section 7.1, the average amount is as high as €9.6 million in the group where the market has risen by over 6.0% during the 60 days prior to the issue. This is clearly higher than for the whole sample (€6.4 million) and also clearly higher than in the other two groups in Figure 13.

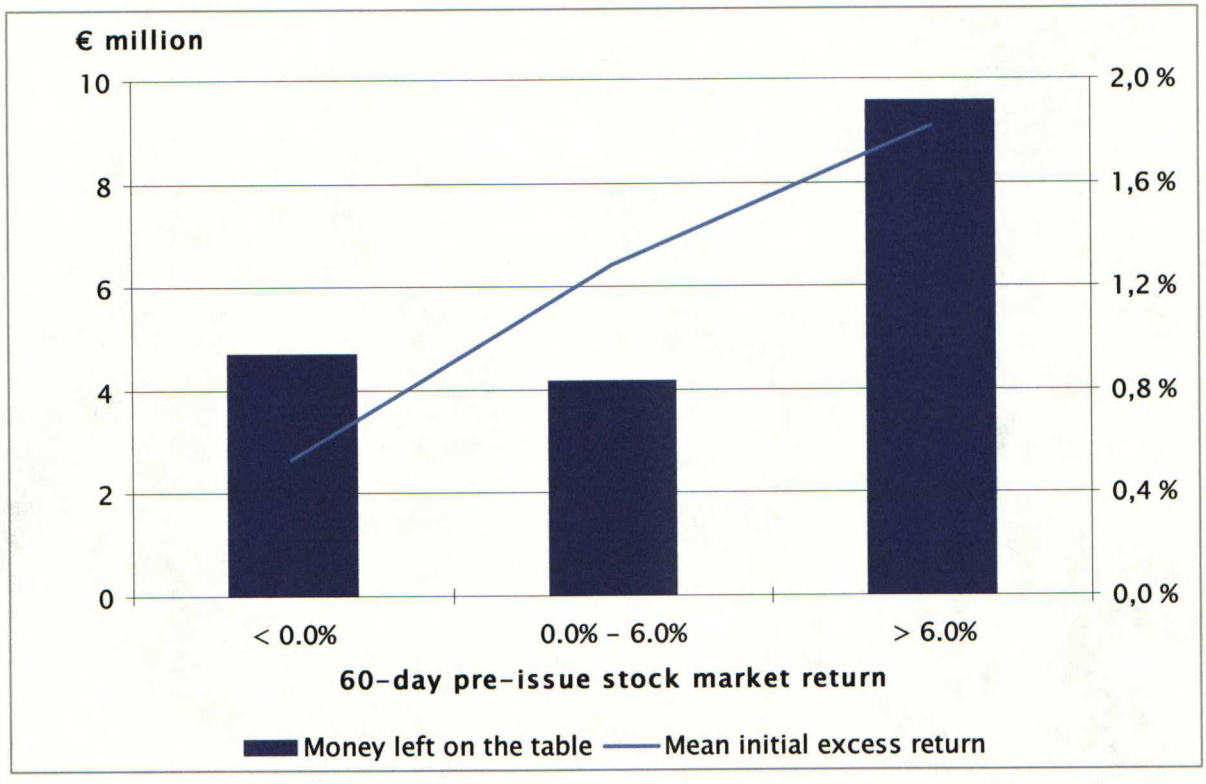


**Figure 13. Initial returns and the amount of money left on the table categorized by prior market movements in the sample of 104 European convertible debt offerings.** The initial excess return is the initial raw return minus the corresponding UBS Warburg European Convertible Index return. Money left on the table is defined as the initial raw return times the size of the issue. Prior market movement is measured using the S&P Europe 350 Index 60-day pre-issue return. The sample sizes for the three categories starting from the lowest market return are 33, 33 and 39, respectively. The sample data excludes the Augusta convertible with a 20.35% initial excess return.

Table IX shows the correlation matrix for the initial returns, amount of money left on the table and the market sentiment variables. All correlation factors between the market sentiment variables and the initial return variables are positive, as expected. The largest correlation (0.165) and significance (p-value of 0.094) is achieved using the 60-day pre-issue return, but the results are not significant at conventional levels. The relation between the initial excess return and the market sentiment variables can be seen also in Figure 18 and Figure 19 in Appendix VIII. The lack of statistical significance is also clear from these figures. The amount of money left on the table receives a significant (p-value of 0.028) and positive correlation (0.216) with the 60-day pre-issue stock market return. This implies that issuers incur larger indirect costs in the form of underpricing in hot issue markets, i.e. when the equity markets have risen.

**Table IX**

**Pearson correlations between initial return and market sentiment variables**

The initial excess return is the initial raw return minus the corresponding UBS Warburg European Convertible Index return. The initial raw return is the return from buying at the offer price and selling at the closing market price on the first day of public trading. Money left on the table is defined as the initial raw return times the size of the issue. The last three variables denoted with S&P are S&P Europe 350 Index pre-issue returns. The first two are for the periods of 30 trading days and 60 trading days before the issue. The last return is calculated for the period of 30 trading days ending 30 trading days before the issue. The sample data excludes the Augusta convertible with a 20.35% initial excess return. *** indicates significance at the 0.1% level.

| | **Initial raw return** | **Initial excess return** | **Money left on the table** | **S&P 350 -30 to 0** | **S&P 350 -60 to 0** | **S&P 350 -60 to -30** |
|---|---|---|---|---|---|---|
| **Initial raw return** | 1 | | | | | |
| **Initial excess return** | 0.860*** (0.000) | 1 | | | | |
| **Money left on the table** | 0.667*** (0.000) | 0.575*** (0.000) | 1 | | | |
| **S&P 350 -30 to 0** | 0.038 (0.700) | 0.049 (0.620) | 0.099 (0.319) | 1 | | |
| **S&P 350 -60 to 0** | 0.145 (0.143) | 0.165 (0.094) | 0.216* (0.028) | 0.367*** (0.000) | 1 | |
| **S&P 350 -60 to -30** | 0.103 (0.298) | 0.109 (0.270) | 0.113 (0.255) | -0.494*** (0.000) | 0.625*** (0.000) | 1 |

Partitioning the sample data by country of issuance introduces more significant results in France (N = 35). The French subsample indicates a positive correlation factor of 0.371 with a 0.028 p-value between the initial excess return and the 60-day pre-issue S&P Europe 350 Index return. The correlation between money left on the table and 60-day pre-issue stock market return is 0.395 with a p-value as low as of 0.019. The market sentiment, therefore, seems to impact the initial pricing of convertible debt offerings in Europe and especially in France.

### *7.3 Regression analysis*

This section combines the most relevant variables from previous sections into multivariate regression analysis. The variables that reached at least some significance related with the initial pricing of convertible debt offerings are issue size divided by issuer size, standard deviation of stock returns, underwriter reputation and 60-day pre-issue stock market return.

Panel A in Table X presents four regressions using the sample, which excludes the outlier, Augusta convertible issue with a 20.35% initial excess return. In Panel B the regressions

include the Augusta issue for comparison. The dependent variable used in all regressions is the initial excess return.[3] The first regression includes the single variable with the most explanatory power. This is the issue size/firm size variable, which relates to the price-pressure hypothesis and was already regressed against the initial excess return in Table VII. Panel A presents the previous results, but Panel B shows that including the whole sample in the regression the issue size/firm size coefficient increases from 5.98 to 8.51 and the significance of this result also increases (p-value of 0.027). In addition, explanatory power grows to 5.0% measured with $R^2$.

To restrict the effect of differences in different markets, the French sample (N = 33) is studied separately. Using the French sample the issue size/firm size variable receives a coefficient of 9.33, which is significant at the 5% level and also larger than with the whole sample. The explanatory power of this single variable is as high as 14.5% measured with $R^2$. In other markets the regression did not receive any significance. The sample sizes in the other markets are also clearly lower.

In the second regression in Table X the market sentiment variable, which is the 60-day pre-issue S&P Europe 350 Index return, is added to the model. In Panel A the regression shows significance for the individual coefficients only at the 10% level, but the whole model is significant at the 5% level. The coefficient for the market sentiment is small but positive implying higher initial returns in markets with higher pre-issue stock market performance. The model shows 6.4% explanatory power. Panel B shows that the significance levels and the explanatory power of the model once again increase when the whole sample is included in the regression. The coefficients for the variables also increase. Using the whole sample the two-variable model receives a p-value of 0.015 and an $R^2$ of 8.4%.

Again the French market is analyzed and the explanatory power of the two independent variables used is as high as 30.8% measured with $R^2$. The coefficient of the issue size/firm size variable is 8.89, which is higher than for the whole sample. The market sentiment seems to also have a stronger effect in the French market since the coefficient rises to 0.184. The coefficients are significant at the 5% level, and the whole model receives a p-value of 0.005. Significant results were not achieved in the other markets separately.

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[3] Initial raw return is also used as the dependent variable and the results are qualitatively the same.

**Table X**

**Regressions of the initial excess returns on explanatory variables for a sample of 97 European convertible debt offerings in the period 1998 - 2001**

The initial excess return is the initial raw return minus the corresponding UBS Warburg European Convertible Index return. The initial raw return is the return from buying at the offer price and selling at the closing market price on the first day of public trading. In Panel A the sample data excludes the Augusta convertible with a 20.35% initial excess return. In Panel B this issue is included in the data. Seven other issues are excluded due to insufficient data. Numbers in parentheses are p-values. * indicates significance at the 5% level.

Panel A: The sample excludes the convertible issue with an initial excess return of 20.35%

| | Regressions | | | |
|---|---|---|---|---|
| Variables | (1) | (2) | (3) | (4) |
| Intercept | 0.670 | 0.507 | 0.0763 | 0.115 |
| | (0.113) | (0.236) | (0.934) | (0.911) |
| Issue size/firm size | 5.98 | 5.362 | | 4.424 |
| | (0.066) | (0.098) | | (0.189) |
| Volatility | | | 0.0290 | 0.0167 |
| | | | (0.096) | (0.386) |
| S&P 60-day return | | 0.0758 | 0.0663 | 0.0737 |
| | | (0.089) | (0.130) | (0.105) |
| Underwriter reputation | | | -0.847 | -0.584 |
| | | | (0.144) | (0.341) |
| F-ratio | 3.45 | 3.23* | 2.706* | 2.01 |
| | (0.066) | (0.044) | (0.049) | (0.099) |
| R2 (%) | 3.5 | 6.4 | 7.7 | 8.2 |
| Sample size | 97 | 97 | 97 | 97 |

Panel B: The sample includes the convertible issue with an initial excess return of 20.35%.

| | Regressions | | | |
|---|---|---|---|---|
| Variables | (1) | (2) | (3) | (4) |
| Intercept | 0.621 | 0.412 | 0.354 | 0.217 |
| | (0.213) | (0.413) | (0.743) | (0.858) |
| Issue size/firm size | 8.51* | 7.635* | | 6.391 |
| | (0.027) | (0.045) | | (0.107) |
| Volatility | | | 0.0281 | 0.0154 |
| | | | (0.170) | (0.499) |
| S&P 60-day return | | 0.0982 | 0.0891 | 0.0961 |
| | | (0.062) | (0.084) | (0.073) |
| Underwriter reputation | | | -1.158 | -0.828 |
| | | | (0.089) | (0.253) |
| F-ratio | 5.059* | 4.38* | 2.924* | 2.60* |
| | (0.027) | (0.015) | (0.038) | (0.041) |
| $R^2$ (%) | 5.0 | 8.4 | 8.1 | 10.3 |
| Sample size | 97 | 97 | 97 | 97 |

The third regression in Table X includes the volatility of the underlying stock, market sentiment and underwriter reputation as independent variables. These were chosen on the basis that they give the most explanatory power in a three-variable model for the sample, where the Augusta convertible issue is excluded. The underwriter reputation is a dichotomous variable receiving a value of one if the underwriter has received the highest ranking of 9 and a value of zero in other cases.

Panel A in Table X shows that the model as a whole is significant at the 5% level. Volatility has a positive coefficient indicating larger initial underpricing with more volatile underlying stock returns. This coefficient is only modestly significant (at the 10% level), though. Market sentiment loses some significance compared with the two-variable model, but is still positive. The underwriter reputation variable has a negative relation to initial pricing implying that convertible debt offerings underwritten by the most prestigious investment banks are less underpriced than other issues. This result is not significant, though. Volatility, market sentiment and underwriter reputation receive 7.7% explanatory power. Using the full sample in Panel B in Table X the $R^2$ is again increased compared with the results excluding the issue. Volatility, market sentiment and underwriter reputation have 8.1% explanatory power.

In the French sample the three-variable regression model is very significant with a p-value of 0.006. Explanatory power measure with $R^2$ is 33.8%. Market sentiment variable receives a clearly increased coefficient of 0.239 and this is also very significant (p-value of 0.004). This result was already found in section 7.2.6. Volatility has a more significant (p-value of 0.061) relation with the initial excess return than for the whole sample. Underwriter reputation is insignificant. In the UK, volatility receives a negative and significant coefficient. This odd phenomenon was already observed in Figure 11.

The final regression in Table X includes all four variables as independent variables. In Panel A where the Augusta issue is excluded from the sample the whole model receives a p-value of only 0.099. Any of the coefficients are not significant even at the 10% level. The coefficients do, however, receive qualitatively same values as in previous regressions. Explanatory power of the four-variable model rises to 8.2% measured with $R^2$.

Panel B in Table X shows how the results are slightly more significant than in Panel A. Including the outlier Augusta convertible issue in the sample increases the explanatory power

of the independent variables to 10.3%. The whole model is also significant at the 5% level, but from the coefficients only market sentiment receives significance even at the 10% level.

The four-variable regression model works quite well in explaining the initial excess returns in the French market. The model is significant at the 1% level and it receives a remarkable 41% explanatory power. Market sentiment has a positive coefficient of 0.23 and is significant at the 1% level. Issue size/firm size variable has a coefficient of 7.65 and is slightly significant with a p-value of 0.061. Volatility and underwriter reputation are not significant in the four-variable model with the French data.

To analyze the reliability of the regression analysis the correlation matrix of the independent variables is constructed in Appendix IX. The only independent variables with statistically significant correlation are the issue size/firm size and the underwriter reputation variables. This correlation is quite small (-0.237), though, so any severe multicollinearity problems do not seem to exist. In addition, Figure 20 in Appendix IX shows that the adjusted residuals of the regression are quite well normally distributed, which also implies a reliable regression model. The normality of the adjusted residuals is also verified with the Kolmogorov-Smirnov test, which gives a p-value of 0.730 implying normality.

*7.4 Long-run performance*

This section examines the long-run performance of new convertible debt issues. Mean and median raw and excess buy-and-hold returns from the offer price to the closing market price 6 and 12 calendar months after the offering are calculated in Table XI. Looking first at the raw returns, the convertible bonds seem to perform quite well during the first year after the offering. The buy-and-hold return for the first six months is 5.8% and this is also significant at the 1% level. The first year raw return is even larger (9.24%) and significant at the 5% level. In the last six months the raw buy-and-hold return does not significantly differ from zero. The median raw returns indicate a significantly positive return only for the first six months, though. The excess buy-and-hold returns show no significance at all, which implies that new issues of convertible debt neither underperform nor outperform the market for at least in the first year after the offer.

**Table XI**

**Selected mean and median percentage raw and excess buy-and-hold returns for a sample of 105 European convertible debt offerings in the period 1998 – 2001.**

The raw buy-and-hold return is calculated as the percentage return from the offer price to the closing price on the last day of the holding period. The excess buy-and-hold return is the convertible bond market-adjusted return, defined as the raw buy-and-hold return minus the corresponding UBS Warburg European Convertible Index return for the corresponding period. P-value describes the significance level in a 2-tailed t-test. *** and * indicate significance of the Wilcoxon sign-rank test at the 0.1% and 5% levels, respectively.

| | Raw buy-and-hold returns | | Excess buy-and-hold returns | |
|---|---|---|---|---|
| Holding period | Mean (p-value) | Median | Mean (p-value) | Median |
| Initial day | 1.56 (0.000) | 0.50*** | 1.43 (0.000) | 1.03*** |
| 0 – 6 months | 5.80 (0.005) | 1.20* | 2.85 (0.121) | 0.22 |
| 6 – 12 months | 2.66 (0.406) | -1.45 | 0.37 (0.894) | -1.48 |
| 0 – 12 months | 9.24 (0.025) | 0.18 | 3.89 (0.288) | 0.33 |

## 8 Summary and conclusions

The main objective of this study was to find out whether convertible debt offerings in Western Europe are underpriced. Indeed, using a sample of 105 convertible debt offerings from the 1998 – 2001 period I report an average initial excess return of 1.43%, which is significant at the 0.1% level. This result is consistent with the winner's curse phenomenon (Rock 1986), which states that new security issues must be underpriced on average to keep the uninformed investors in the market. The small underpricing result also supports the fact that the bond market is dominated by well-informed institutional investors (Datta et al. 1997). The average initial excess return of 1.43% is also clearly lower than in equity IPOs but higher than in seasoned equity or straight debt issues, as was assumed in the *first hypothesis*. This is consistent with the differential information model by Barry and Brown (1985), which implies that the size of underpricing is positively related to the amount of available pricing related information. The underpricing result of 1.43% is also similar to the 1.11% that Kang and Lee (1996) found by studying 91 US convertible debt offerings in 1988 – 1992.

The sample period in this thesis was 1 October 1998 – 30 September 2001, which included both the techno boom and the following stock market crash. As these phenomena were quite extreme it is possible that the results concerning the initial pricing of convertible debt offerings were somewhat distorted. On the other hand, the averaged results were probably better in this case than if the sample period would have consisted only of a growing or declining equity market. It was also found in this study that the initial underpricing was at a higher level during the last year of the techno boom (year ending 30 September 2000). Therefore, the initial pricing behavior of convertible debt seemed to follow the manners of the IPO market in the same period. Any statistically significant differences in initial pricing in different time periods were not found, though.

The *second hypothesis* tested in this thesis was the price pressure hypothesis by Wasserstein and Wydler (1988). In contrast to what Wasserstein and Wydler (1988) found for straight bonds in the Swiss capital market and Kang and Lee (1996) found for convertible bonds in the US market, some support for the price pressure hypothesis was found in this study. First, the initial underpricing was found to slightly grow with growing size classes. Second, the issue size divided by the issuing company size was found to be a statistically significant factor in explaining the initial excess returns using the whole sample. The variable explained 4% of the

cross-sectional variation in initial excess returns. Third, the issue size had a very strong and significant linear correlation (0.59) with the initial excess returns using the UK data, albeit the sample size was quite small (N = 14).

Datta et al. (1997) found that IPOs of speculative grade debt are significantly underpriced at issue while investment grade IPOs are significantly overpriced at issue. The results of this thesis indicate, however, that bond rating is not a significant determinant of initial European convertible debt offering returns and the *third hypothesis* is rejected. This result is consistent with the results obtained from the US convertible debt market in the study by Kang and Lee (1996). Also the *fourth hypothesis*, which stated that initial underpricing should be lower with more mature issuers, did not receive any significant support. Strong empirical evidence supporting this hypothesis was found by Ritter (1991) for equity IPOs and Kang and Lee (1996) for convertible debt offerings in the US.

The standard deviation and the beta the of the underlying stock were hypothesized to act as proxies for ex ante uncertainty regarding the market clearing price of the new issue and, therefore, have a positive relation with the initial excess returns. This was the subject of *hypotheses five and six*. The standard deviation was found to be positively correlated with the initial excess returns with a factor of 0.181, but this result was significant only at the 10% level. The equity beta did not show any relation to the initial pricing. Kang and Lee (1996) could also not relate the standard deviation of stock returns with initial underpricing of US convertible debt offerings, but they found that equity beta was a significant determinant of the initial returns.

The *seventh hypothesis* assumed that the degree of underpricing in European convertible debt offerings is inversely related to the underwriter's reputation. In contrast to Kang and Lee (1996), who did not find evidence for US convertible debt offerings, some support was found in this thesis. The mean initial excess return for the less prestigious underwriter group was 1.70% with 70.2% of the returns positive. The result for the prestigious underwriter group was 0.69% with 57.4% of the returns positive. The means differed from each other only at the 10% significance level, though. The list of underwriter rankings was obtained from Loughran and Ritter (2001), who constructed it from the US perspective. This might slightly distort the results obtained with European data since in Europe investments banks might be rated slightly differently.

The *eighth hypothesis* suggested that a larger equity component in a convertible bond measured with the probability to conversion would be related with higher initial returns. The probability of conversion was calculated as the conversion price divided by the underlying stock price at one day before the issue and it was found to have no relation with the initial pricing of the European convertible debt offerings.

The *ninth hypothesis* suggested that convertible debt issued in hot-issue markets would be more underpriced than in other periods. This market sentiment was measured with the 60-day pre-issue S&P Europe 350 Index return. The above discussion related with the three time periods, in which the initial excess returns were measured already indicated that market sentiment seems to have an impact on the initial pricing of convertible debt offerings. In addition, it was found that the 60-day pre-issue stock market return had a correlation factor of 0.165 with the initial excess returns. This was significant only at the 10% level, though. Applying the money left on the table concept showed a positive and significant correlation with the market sentiment variable. This result is consistent with Loughran and Ritter (2002) and implies that issuers are not as concerned about the indirect costs of underpricing in a favorable market situation as they are in a bad market situation. The results related with market sentiment could have been more significant if the pre-issue return of each individual stock market would have been used as a measure of market sentiment.

In a four-variable regression model issue size/firm size, volatility, market sentiment and underwriter reputation could significantly explain 10.3% of the cross-sectional variation in initial excess returns. As comparison, Kang and Lee (1996) resulted with 9.6% explanatory power (measured with an adjusted $R^2$) for the initial excess returns of US convertible debt offerings using the logarithm of issuer age, volatility, bond rating, duration and equity beta as independent variables.

The one-year performance of new convertible debt offerings was also investigated by looking at the buy-and-hold returns for 6 and 12 months after the issue. The examination of excess returns revealed no significant results, which implies that new issues of European convertible debt neither underperform nor outperform the market for at least in the first year after the offer. This result is similar to Kang and Lee's (1996) findings in the US convertible debt market, but contradictory to results obtained by Aggarwal and Rivoli (1990), for example, who found that IPOs significantly underperform their seasoned counterparts in the one-year

period after issue. The same phenomenon for IPOs was documented by Ritter (1991) using a three-year after-issue period.

Looking at the results it is clear that European convertible debt offerings are, on average, slightly underpriced. Any clear and significant determinants for this underpricing are difficult to find, though. The best regression model could explain only about 10% of the cross sectional variation in initial excess returns. The offerings in the sample were issued in different countries with differently functioning convertible debt markets. In different markets there may be different factors that influence the pricing of security offerings. Possibly better results could have been obtained using a longer time period and only a few countries so that results in single countries would receive significance and different countries could be reliably compared. On the other hand, Kang and Lee (1996) studied purely the US convertible debt market and found variables explaining still only 10% of the initial excess returns. This may be due to the fact that convertible bonds are complex securities with so many unique characteristics in each issue that it is difficult to isolate individual factors related with the underpricing of convertible debt offerings. In addition, the sample consisted of convertible debt offerings by firms that already had convertibles outstanding and of firms that issued their first convertible bond to the market. Clearly, this affects the pricing of a new issue because there is less ex ante uncertainty related to the market clearing price of the new issue for a firm that already has convertible debt outstanding. This difference in uncertainty is not as large as in equity IPOs vs. seasoned equity offerings, though, because of the numerous characteristics of convertible bonds that make the bonds even from the same company different.

A lot of unstudied area remains in the pricing of convertible debt offerings. First, the examination of the European convertible debt market should be conducted in a single market (country) using a long time frame and studying only IPOs of convertible debt. This would reduce the problems mentioned earlier. Second, almost everything that has been studied in the field of IPO underpricing could be studied with convertible debt offerings. This would include, for example, examining the hypotheses that issuers underprice to reduce their legal liability (Keloharju 1993) or that underpricing is a substitute for costly marketing expenditures (Habib and Ljungqvist 2001). Third, theories for the pricing of convertible debt offerings all come from the equity IPO and straight debt offering literature. It would be interesting to see a theory created specifically for the initial pricing of convertible debt offerings.

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**Appendix I**

**Table XII**

**Frequency table of initial percentage returns for a sample of 105 European convertible debt offerings in the period 1998 – 2001**

The initial raw return is the return from buying at the offer price and selling at the closing market price on the first day of public trading. The initial excess return is the initial raw return minus the corresponding UBS Warburg European Convertible Index return.

| | Initial Raw Return | | Initial Excess Return | |
|---|---|---|---|---|
| | Frequency | % | Frequency | % |
| $-5 \leq R < -4$ | 3 | 2.9 | 2 | 1.9 |
| $-4 \leq R < -3$ | 3 | 2.9 | 2 | 1.9 |
| $-3 \leq R < -2$ | 4 | 3.8 | 8 | 7.6 |
| $-2 \leq R < -1$ | 4 | 3.8 | 10 | 9.5 |
| $-1 \leq R < 0$ | 9 | 8.6 | 15 | 14.3 |
| $0 \leq R < 1$ | 33 | 31.4 | 15 | 14.3 |
| $1 \leq R < 2$ | 18 | 17.1 | 20 | 19.0 |
| $2 \leq R < 3$ | 9 | 8.6 | 6 | 5.7 |
| $3 \leq R < 4$ | 4 | 3.8 | 9 | 8.6 |
| $4 \leq R < 5$ | 5 | 4.8 | 6 | 5.7 |
| $5 \leq R < 6$ | 3 | 2.9 | 4 | 3.8 |
| $6 \leq R < 7$ | 2 | 1.9 | 2 | 1.9 |
| $7 \leq R < 8$ | 1 | 1.0 | 2 | 1.9 |
| $8 \leq R < 9$ | 3 | 2.9 | 1 | 1.0 |
| $9 \leq R < 10$ | 0 | 0 | 0 | 0 |
| $10 \leq R < 11$ | 1 | 1.0 | 2 | 1.9 |
| $11 \leq R < 12$ | 0 | 0 | 0 | 0 |
| $12 \leq R < 13$ | 1 | 1.0 | 0 | 0 |
| $\geq 13$ | 2 | 1.9 | 1 | 1.0 |

## Appendix II

### Table XIII
### Kolmogorov-Smirnov test

This test is used to test whether the initial raw and excess returns are normally distributed. $H_0$ is that the variable is normally distributed. A p-value (Sig.) of over 0.05 indicates that the variable is normally distributed.

**One-Sample Kolmogorov-Smirnov Test**

| | | Initial Raw Return | Initial Excess Return |
|---|---|---|---|
| N | | 105 | 105 |
| Normal Parameters[a,b] | Mean | 1,56 | 1,42 |
| | Std. Deviation | 3,68 | 3,47 |
| Most Extreme Differences | Absolute | ,176 | ,125 |
| | Positive | ,176 | ,125 |
| | Negative | -,135 | -,071 |
| Kolmogorov-Smirnov Z | | 1,81 | 1,28 |
| Asymp. Sig. (2-tailed) | | ,003 | ,076 |

a. Test distribution is Normal.

b. Calculated from data.

### Table XIV
### Student's t-test

The t-test shows that the means of both R1 and RE1 are significant at the 0.1% level.

**One-Sample Statistics**

| | N | Mean | Std. Deviation | Std. Error Mean |
|---|---|---|---|---|
| Initial Raw Return | 105 | 1,56 | 3,68 | ,36 |
| Initial Excess Return | 105 | 1,42 | 3,47 | ,34 |

**One-Sample Test**

| | Test Value = 0 | | | | | |
|---|---|---|---|---|---|---|
| | | | | | 95% Confidence Interval of the Difference | |
| | t | df | Sig. (2-tailed) | Mean Difference | Lower | Upper |
| Initial Raw Return | 4,349 | 104 | ,000 | 1,56 | ,85 | 2,27 |
| Initial Excess Return | 4,207 | 104 | ,000 | 1,42 | ,75 | 2,10 |

## Appendix III

### Table XV
### Wilcoxon signed ranks test for the median of the initial returns

H0 is that the median of R1 is zero. The p-values (Sig.) for both the R1 and RE1 are 0.000 so H0 is rejected and the median is significantly (0.1% level) different from zero.

**Ranks**

| | | N | Mean Rank | Sum of Ranks |
|---|---|---|---|---|
| ZERO - Initial Raw Return | Negative Ranks | 65[a] | 46,41 | 3016,50 |
| | Positive Ranks | 23[b] | 39,11 | 899,50 |
| | Ties | 17[c] | | |
| | Total | 105 | | |
| ZERO - Initial Excess Return | Negative Ranks | 67[d] | 58,58 | 3925,00 |
| | Positive Ranks | 37[e] | 41,49 | 1535,00 |
| | Ties | 1[f] | | |
| | Total | 105 | | |

a. ZERO < Initial Raw Return

b. ZERO > Initial Raw Return

c. Initial Raw Return = ZERO

d. ZERO < Initial Excess Return

e. ZERO > Initial Excess Return

f. Initial Excess Return = ZERO

**Test Statistics[b]**

| | ZERO - Initial Raw Return | ZERO - Initial Excess Return |
|---|---|---|
| Z | -4,404[a] | -3,875[a] |
| Asymp. Sig. (2-tailed) | ,000 | ,000 |

a. Based on positive ranks.

b. Wilcoxon Signed Ranks Test

## Appendix IV

### Table XVI
### Initial returns by country of issuance

Initial raw return ($R_1$) is the return from buying at the offer price and selling at the closing market price on the first day of public trading. Initial excess return is the market adjusted return defined as $R_1$ minus the corresponding UBS Warburg European Convertible Index return. The results below are from a total sample of 105 European convertible debt offerings in the period 1998 – 2001.

| Country of issuance | | Initial Raw Return | Initial Excess Return |
|---|---|---|---|
| Finland | N | 1 | 1 |
| | Mean | 0.30 | 1.14 |
| | Median | 0.30 | 1.14 |
| | Minimum | 0.30 | 1.14 |
| | Maximum | 0.30 | 1.14 |
| | Std. Deviation | - | - |
| France | N | 35 | 35 |
| | Mean | 2.22 | 2.28 |
| | Median | 1.21 | 1.37 |
| | Minimum | -4.21 | -2.88 |
| | Maximum | 10.00 | 10.29 |
| | Std. Deviation | 3.37 | 3.20 |
| Germany | N | 6 | 6 |
| | Mean | 3.81 | 3.11 |
| | Median | -0.60 | -0.77 |
| | Minimum | -4.75 | -4.08 |
| | Maximum | 20.79 | 20.35 |
| | Std. Deviation | 10.41 | 9.57 |
| Italy | N | 1 | 1 |
| | Mean | -1.05 | 2.35 |
| | Median | -1.05 | 2.35 |
| | Minimum | -1.05 | 2.35 |
| | Maximum | -1.05 | 2.35 |
| | Std. Deviation | - | - |
| Luxembourg | N | 22 | 22 |
| | Mean | 0.56 | 0.57 |
| | Median | 0.00 | 0.52 |
| | Minimum | -1.00 | -2.68 |
| | Maximum | 3.30 | 4.09 |
| | Std. Deviation | 1.13 | 1.73 |
| Netherlands | N | 15 | 15 |
| | Mean | 2.84 | 2.44 |
| | Median | 1.95 | 1.71 |
| | Minimum | -2.50 | -0.60 |
| | Maximum | 13.00 | 10.63 |
| | Std. Deviation | 3.74 | 2.96 |
| Switzerland | N | 11 | 11 |
| | Mean | 0.59 | -0.36 |
| | Median | 0.25 | -1.20 |
| | Minimum | -3.30 | -4.63 |
| | Maximum | 5.55 | 4.08 |
| | Std. Deviation | 2.39 | 2.84 |
| UK | N | 14 | 14 |
| | Mean | 0.18 | 0.18 |
| | Median | 0.53 | 0.89 |
| | Minimum | -4.62 | -3.54 |
| | Maximum | 2.96 | 2.81 |
| | Std. Deviation | 2.20 | 1.91 |

## Appendix V

### Table XVII
### T-test for the equality of mean initial excess returns of convertible bonds issued in France and Luxembourg

Initial raw return ($R_1$) is the return from buying at the offer price and selling at the closing market price on the first day of public trading. Initial excess return is the market adjusted return defined as $R_1$ minus the corresponding UBS Warburg European Convertible Index return. The results below are from a total sample of 105 European convertible debt offerings in the period 1998 – 2001. Levene's test for equality of variances gives a p-values of under 0.05 so equal variances are not assumed. If the p-value (Sig.) of the t-test for the equality of means is under 0.05 the $H_0$ is rejected and the means differ from each other.

| | Country of issuance | N | Mean | Std. Deviation | Std. Error Mean |
|---|---|---|---|---|---|
| Initial Raw Return | France | 35 | 2,22 | 3,37 | ,57 |
| | Luxembourg | 22 | ,56 | 1,13 | ,24 |
| Initial Excess Return | France | 35 | 2,28 | 3,20 | ,54 |
| | Luxembourg | 22 | ,57 | 1,73 | ,37 |

**Independent Samples Test**

| | | Levene's Test for Equality of Variances | | t-test for Equality of Means | | |
|---|---|---|---|---|---|---|
| | | F | Sig. | t | df | Sig. (2-tailed) |
| Initial Raw Return | Equal variances assumed | 19,111 | ,000 | 2,23 | 55 | ,030 |
| | Equal variances not assumed | | | 2,69 | 45,00 | ,010 |
| Initial Excess Return | Equal variances assumed | 10,079 | ,002 | 2,29 | 55 | ,026 |
| | Equal variances not assumed | | | 2,60 | 54,06 | ,012 |

## Appendix VI

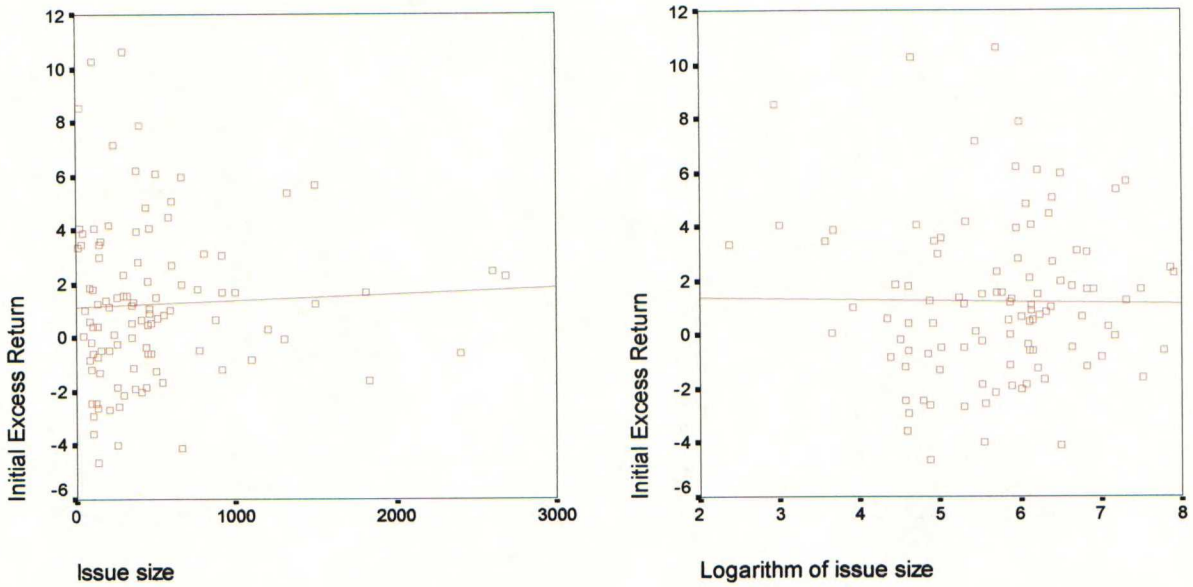


**Figure 14. The relationship between initial excess return and issue size in the sample of 105 European convertible debt offerings.** The scatter diagrams exclude one issue with an initial excess return of 20.35%.

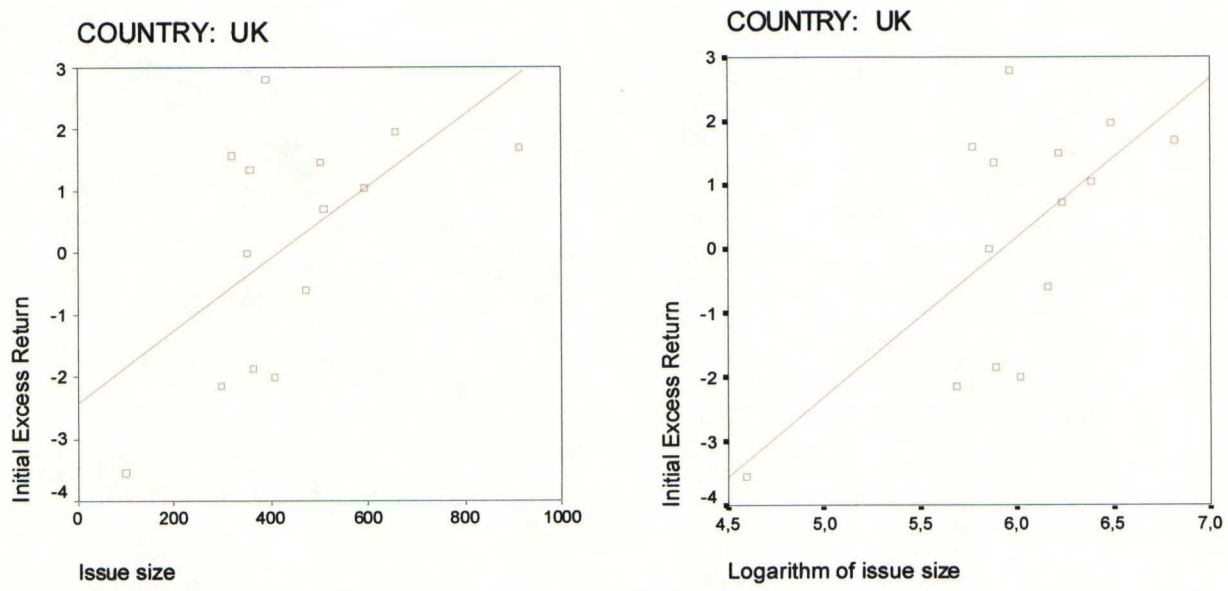


**Figure 15. The relationship between initial excess return and issue size in the United Kingdom.** The sample includes 14 convertible debt offerings from the period 1998 - 2001.

## Appendix VII

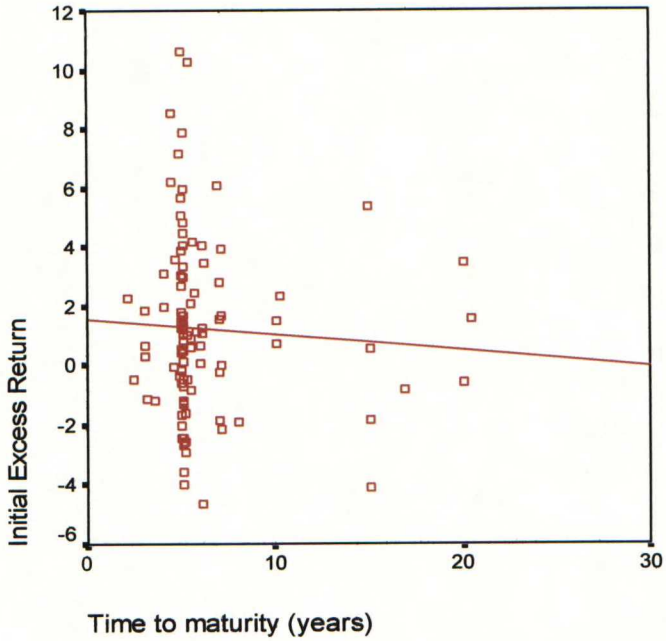


**Figure 16. The relationship between initial excess return and time to maturity in the sample of 104 convertible debt offerings.** The scatter diagram excludes one issue with an initial excess return of 20.35%.

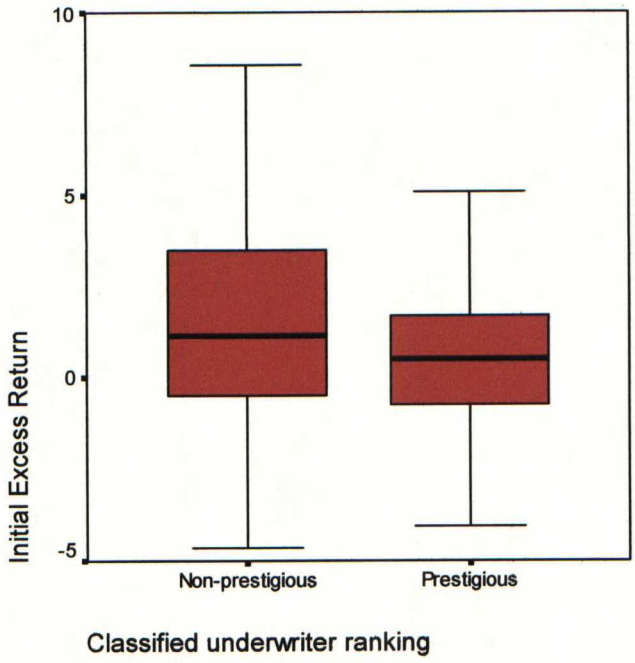


**Figure 17. A boxplot diagram describing the initial excess returns of bonds underwritten by prestigious vs. non-prestigious underwriters in the sample of 104 European convertible debt offerings.** The box represents the interquartile range which contains 50% of the values. The whiskers are lines that extend from the box to the highest and lowest values. A line across the box indicates the median. The sample excludes one issue with an initial excess return of 20.35%.

## Appendix VIII

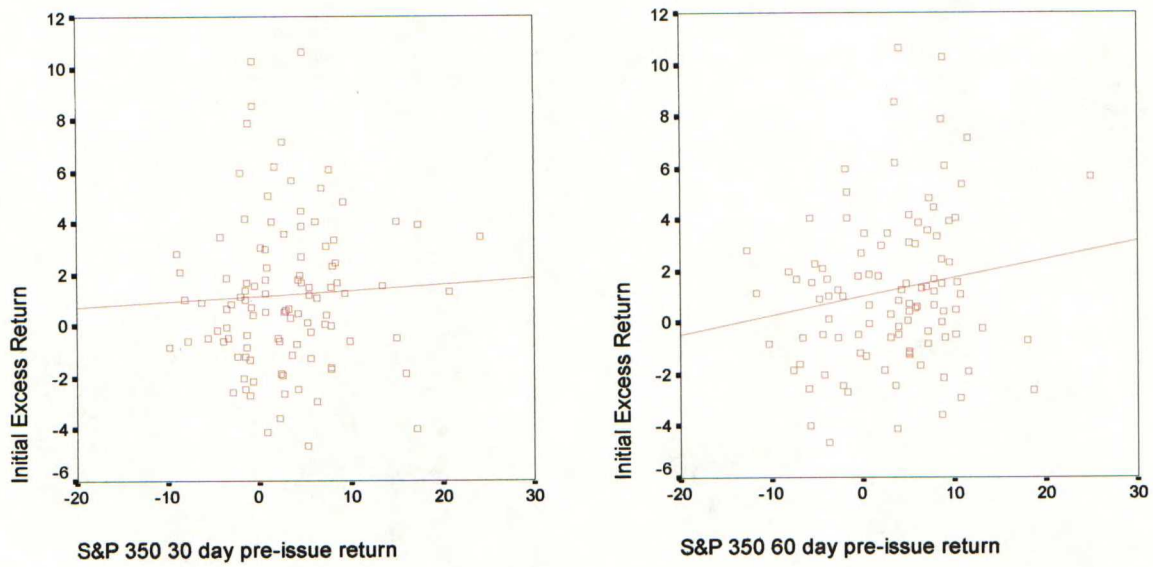


**Figure 18. The relationship between initial excess return and market sentiment in the sample of 104 convertible debt offerings.** The 30- and 60-day pre-issue returns for the S&P Europe 350 Index are on the x-axis. The sample excludes one issue with an initial excess return of 20.35%.

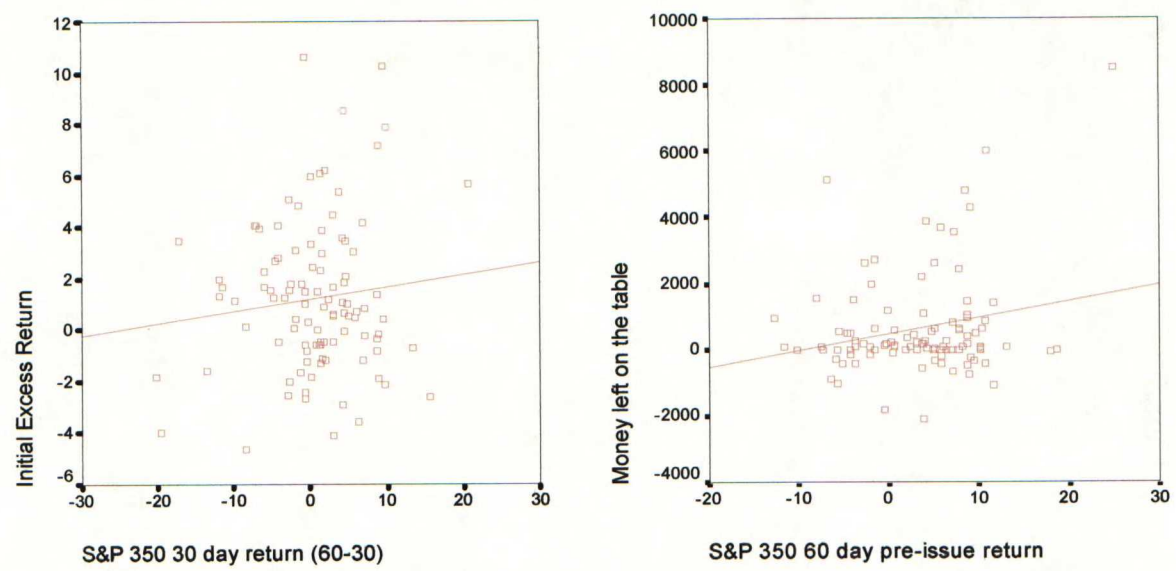


**Figure 19. The relationship between initial excess return/money left on the table and market sentiment in the sample of 104 convertible debt offerings.** The 30-day pre-issue return for the S&P Europe 350 Index for a period ending 30 trading days before the issue is on the x-axis. Money left on the table is defined as the initial raw return times the size of the issue. The sample excludes one issue with an initial excess return of 20.35%.

## Appendix IX

**Table XVIII**

**Pearson correlations between regression variables**

The initial excess return is the initial raw return minus the corresponding UBS Warburg European Convertible Index return. The initial raw return is the return from buying at the offer price and selling at the closing market price on the first day of public trading. * indicates significance at the 5% level.

| | Initial excess return | Issue size/ firm size | Volatility | S&P 60-day return | Underwriter reputation |
|---|---|---|---|---|---|
| **Initial excess return** | 1 | | | | |
| **Issue size/ firm size** | 0.224* (0.027) | 1 | | | |
| **Volatility** | 0.154 (0.121) | 0.114 (0.268) | 1 | | |
| **S&P 60-day return** | 0.186 (0.058) | 0.123 (0.228) | 0.044 (0.657) | 1 | |
| **Underwriter reputation** | -0.193* (0.049) | -0.237* (0.019) | -0.076 (0.446) | -0.041 (0.680) | 1 |

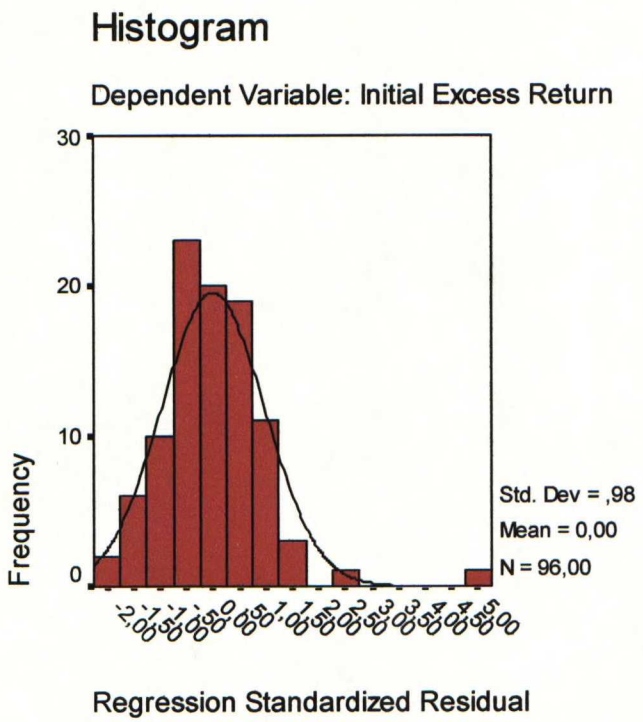


**Figure 20. Analysis of regression residuals.** The figure depicts the histogram of the adjusted residuals from the four-variable regression model in Panel B in Table X.